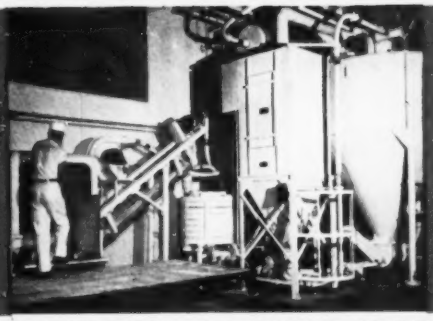
AUGUST 1953
PRICE 35 CENTS

ELECTRICAL CONSTRUCTION AND MAINTENANCE

WITH ELECTRICAL CONTRACTING

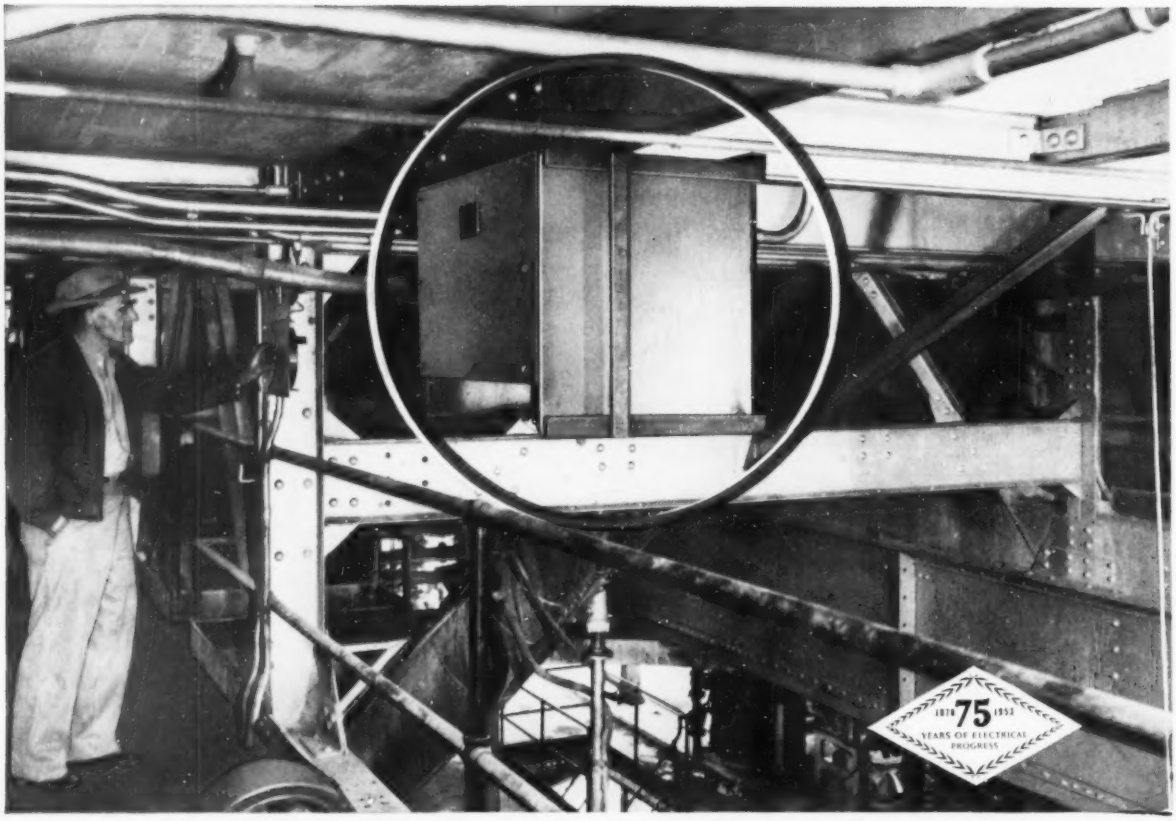
3 KW MERCURY *lighting in Cleveland automobile assembly plant*



AUTOMATIC CONTROLS *operate material handling equipment in Wisconsin bakery*

POWER AND LIGHT *requirements for Rockaways' Playland of New York*

A McGRAW-HILL PUBLICATION | 52ND YEAR



60-kvar capacitor unit shown above is part of the 600-kvar installation that permitted a 10% increase in load.

Capacitors can be put in out-of-the-way places—such as on these existing horizontal I-beams to conserve space.

Seriously overloaded circuits take on 10% more load after G-E Capacitors are added

American Crystal Sugar Co. profits from an emergency that arose during a recent sugar refining "campaign."

During a sugar beet "campaign" which lasts from July to December, the American Crystal Sugar Company of Clarksburg, California, operates 24 hours a day. Shutdowns mean costly financial losses.

That's why the company really had an emergency on its hands when its electrical facilities became seriously overloaded in a recent campaign. However, the solution was simple. A call to G.E. brought 600 kvar of capacitors to the plant in time to prevent a "burnout."

A short time after the order was placed, the capacitors were installed and in operation. The plant's power factor climbed from 86% to about 97%. This relieved the overloading—*and released enough capacity to handle a subsequent 10% increase in load!*

CAPACITORS HAVE MANY USES

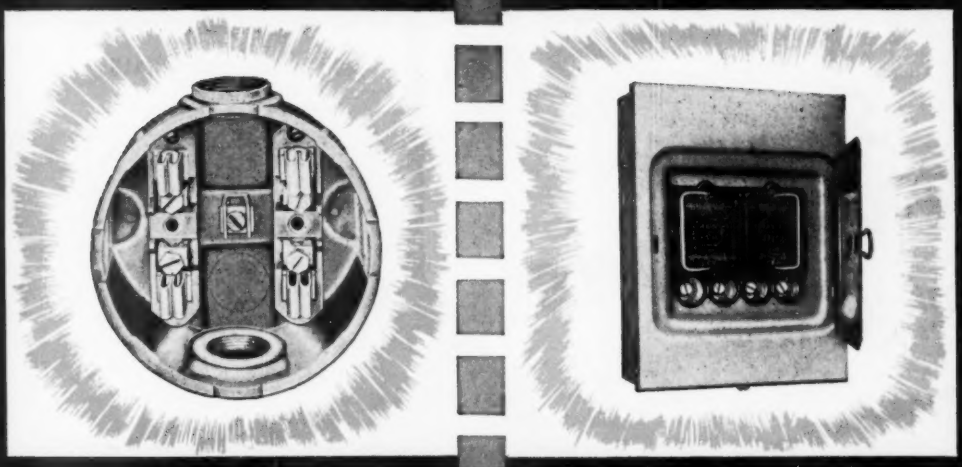
They can often free distribution facilities to carry 20 to 30% more load. Where voltage drop is a problem, capacitors can provide the needed voltage boost inexpensively. And if your power factor is below 85%, and you have a power-factor or kva-demand clause in your contract, they can usually cut your power costs.

For more information, see your local G-E Apparatus sales office, or authorized G-E agent or distributor. Or write to Section 407-209 for booklet GEA-5632—"How to Reduce Power Costs and Gain System Capacity." *General Electric Company, Schenectady 5, New York.*

You can put your confidence in—

GENERAL ELECTRIC

They're Designed to MATCH



And Save you MONEY

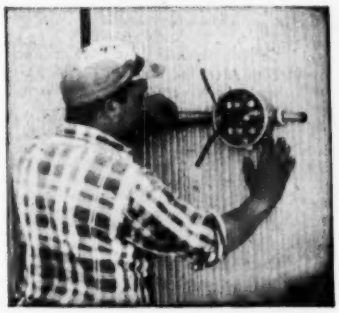
Make the job easier and quicker by using Murray matched equipment. All elements of each unit are designed to go together. Take the Murray Meter Socket and the Murray "Main and Range" illustrated. Installation is easier and quicker because knock-outs are positioned just right. Wiring is simplified because lugs are similar on both units. In addition, once installed, Murray matched equipment looks better and more workmanlike than devices from two different manufacturers.

HERE'S *Proof* THAT Murray MATCHED EQUIPMENT *SAVES MONEY!*

Levittown, Long Island (17,000 homes) is using Murray matched equipment to handle the load. Now, another large project is being developed —16,000 homes at Levittown, Pennsylvania. Murray matched equipment is being used again!

Further proof of the advantages of matched equipment is at Fairless Hills, Pennsylvania — a project of 4000 homes. The Murray Meter Socket and the Murray "Main and Range" are back-to-back on a large percentage of these homes.

It comes down to this — Murray matched equipment saves time in installation — and time is money. Whether it's a huge project or a bungalow — matched equipment saves time and money.



One out of the 16,000 modern houses being built at Levittown, Pa. Murray Meter Socket is located on outside wall, rear. Murray "Main and Range," located in a utility closet, backs it up on the inside.

Electricians like Murray equipment because it's easy to install. There's always plenty of wiring room in Murray equipment!

MURRAY MANUFACTURING CORPORATION
1250 Atlantic Avenue, Brooklyn 16, New York

Service Entrance & Meter Equipment • Magnetic Hydraulic Circuit Breakers • Safety Switches (Types A, C & D) • Current Limiting Reactors • Crows'nest Aerial Ladders

APPLETON

"ST" Series CONNECTORS*

for

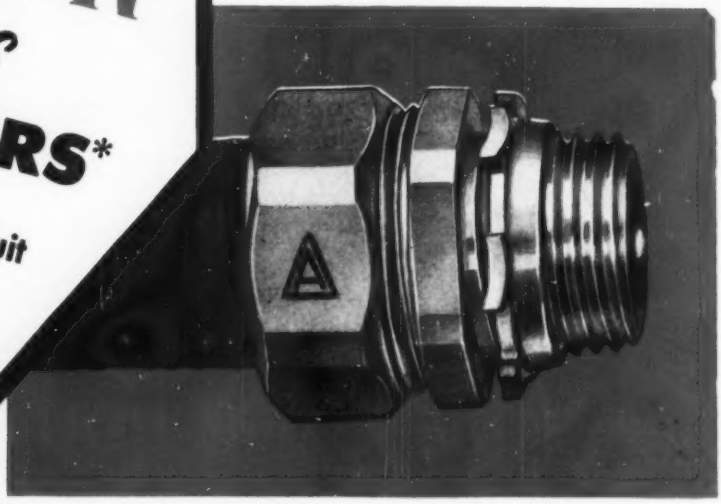
Liquid Tight Flexible Conduit

("Sealtite" or Equivalent Products)

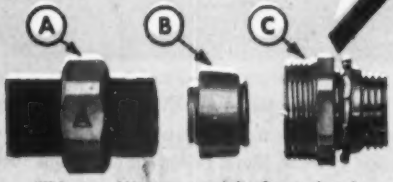
*Patent Applied For

The only fittings of their kind!

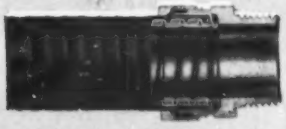
USED WHEREVER ELECTRICAL SYSTEMS MUST BE SEALED AGAINST WATER, OIL, DIRT, GREASE, ACID AND CHEMICALS



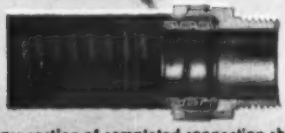
HERE'S HOW THEY WORK:



Slide nut (A) over conduit. Screw ferrule and sleeve assembly (B) into conduit. Tighten nut onto connector body (C).



Completely assembled "ST" connection. (IMPORTANT: nut must be tightened as far as possible to complete compression action which assures liquid-tight seal.)



Cross section of completed connection shows how tapered end of nut compresses ferrule well . . . seals perfectly and gives positive ground between conduit and connector.

QUICK, EASY to INSTALL . . . Complete from ONE Source

On any machinery wiring job, contract or time and material, you'll do better with Appleton "ST" Series Liquid Tight Connectors.

First, they provide the protection the job requires. *Second,* they are engineered for quick, easy installation . . . even an apprentice can complete a job that will pass inspection! *Third,* ALL parts are supplied from *one* source . . . your wholesaler carries a complete stock.

Appleton "ST" Series Connectors come straight, 45° and 90° to fit flexible conduit sizes from ⅜" to 1¼". Also 1½" and 2" straight.

For complete information, contact your wholesaler or write, today!

A QUALITY LINE OF ELECTRICAL FITTINGS ALL FROM ONE SOURCE SOLD THROUGH ELECTRICAL WHOLESALERS ONLY

APPLETON ELECTRIC COMPANY

1704 Wellington Avenue • Chicago 13, Illinois

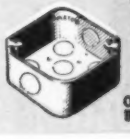
Also Manufacturers of

Explosion-Proof Fixtures

Unilet Fittings

Industrial Lights

Reelites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ELECTRICAL CONSTRUCTION AND MAINTENANCE

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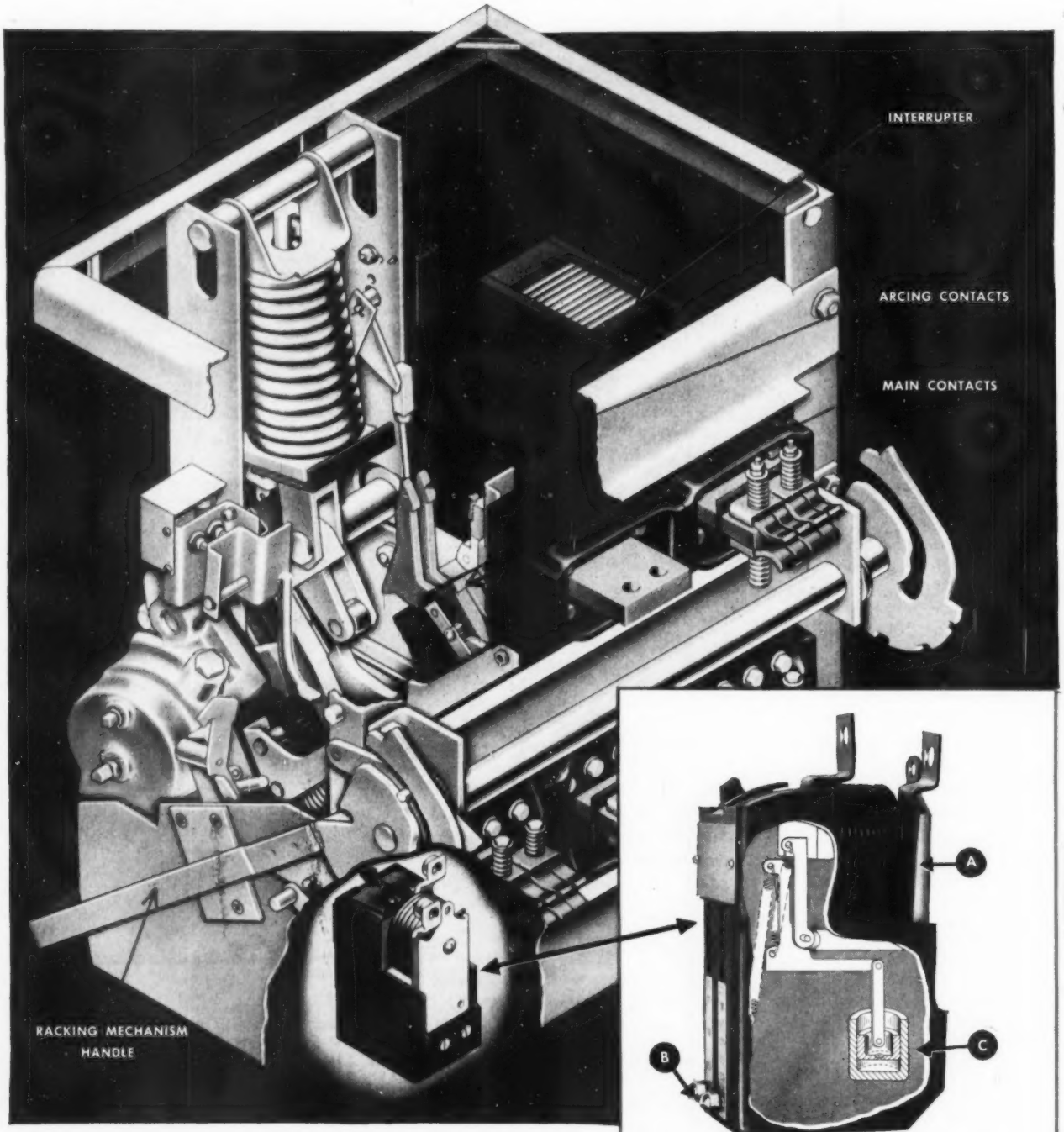
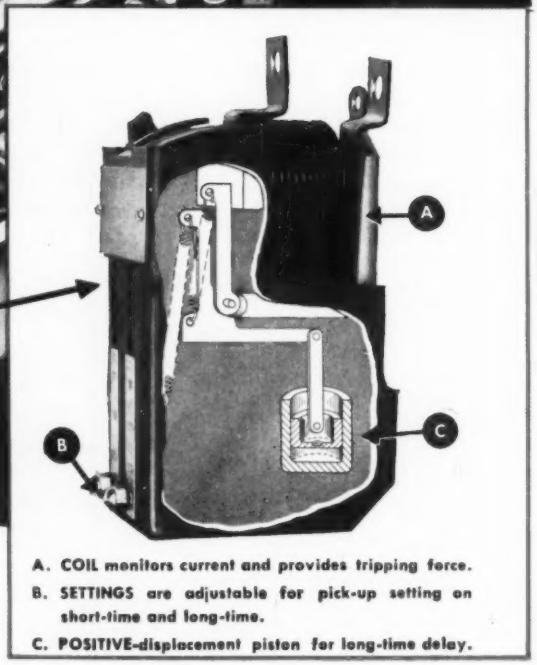
New air circuit breakers





FOR SELECTIVE TRIPPING, the removable magnetic over-current trip device, in closeup at right, introduces delay into the tripping time of AK breaker, shown in cutaway above. Pickup of either the long-time or short-time element is easily adjustable. The device itself may be replaced by a factory-calibrated element to change current ratings.

A. COIL monitors current and provides tripping force.

B. SETTINGS are adjustable for pick-up setting on short-time and long-time.

C. POSITIVE-displacement piston for long-time delay.

give you *Selective tripping* up to full interrupting rating!

Reduce plant shutdowns by using a selective system

For the first time in the development of air circuit breakers, General Electric has made possible fully selective operation —with all units applied up to full interrupting ratings— throughout its *entire line* of Type AK breakers.

New Types AK-1-50, AK-1-75, and AK-1-100—the three new breakers with *interrupting* ratings of 50,000 . . . 75,000 . . . and 100,000 amperes—together with the AK-1-15 and -25 all have 30-cycle momentary ratings equal to their interrupting ratings. This exclusive G-E development means breakers do *not* have to be derated when applied in a selective system.

Built-in magnetic over-current tripping devices provide selective tripping of the breakers to isolate faults. All breakers have direct-acting, magnetic tripping devices which do not require current transformers. The trip devices provide three tripping functions: long, short-time delay, and instantaneous, in whatever combination required for different applications.

Outstanding design features of the new AK breakers are highlighted by G-E exclusives—

Stored-energy closing mechanism—for safer, surer closing even though control power is lost during closing operation. A G-E exclusive.

Selective operation—up to full interrupting rating, another G-E exclusive.

Multi-slot interrupters, exclusive with G.E., provide faster, safer, arc extinction.

Interchangeable parts—on new breakers cut down your parts stocking problem and simplify maintenance.

Racking mechanism—is part of breaker and permits inspection outside compartment away from live parts.

New equipments—designed and tested to withstand up to 100,000 amps. Design improvements give you many new features and benefits.

New breaker-handling windlass—is designed as integral part of units. Optional for both indoor and outdoor equipments.

For details on the new low-voltage AK breakers and the new low-voltage drawout switchgear equipments—ask your G-E sales representative for Bulletins GEA-5915 and GEA-5916, or write to General Electric Company, Schenectady 5, N. Y.

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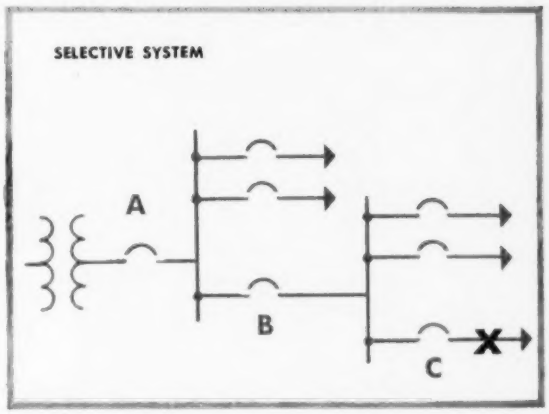


SELECTIVE TRIPPING with G-E system up to full interrupting rating isolates a fault at X by opening only breaker "C," leaving rest of system in operation. With a cascaded system, a fault at X may trip breaker "A" and shut down the whole system.

WITH RACKING MECHANISM, operator can easily pull out G.E.'s new air circuit breaker from compartment. All AK breakers and drawout switchgear equipment are fully co-ordinated in design.

You can put your confidence in—

GENERAL ELECTRIC

Leading from a substation, Hazard self-supporting cable carries power to switchgear in foreground. Cable is 3/C, 350,000CM, Watertite-Hazaprene cabled and bound to Copperweld messenger with a copper binder tape.

delivers the goods AT ANCHOR ROME TEXTILE MILLS

In a recent modernization at the Rome, Georgia plant of Anchor Rome Mills, Hazard Watertite-Hazaprene Self-Supporting Aerial Cable was used. Here, you can see the extreme flexibility of the installation . . . it can be strung close to buildings and existing structures with complete safety.

The excellent electrical and physical characteristics of Watertite-Hazaprene were important in the selection of power cable at Anchor Rome Mills. Watertite insulation provides the needed moisture and heat resistance with toughness, resilience and high dielectric strength. The rugged, weather-resistant Hazaprene sheath—the same used for Hazard mining cables—assures long-lived dependability.

Of additional advantage to industrial installations is the "three-in-one" construction of Hazard self-supporting cable. Pre-assembled cable, messenger and binder provides safety, low cost, quick installation and neat appearance. Relocation, when needed, is a simple operation. Get the complete story on dependable, money-saving industrial aerial power circuits from your Hazard representative or write today . . . Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

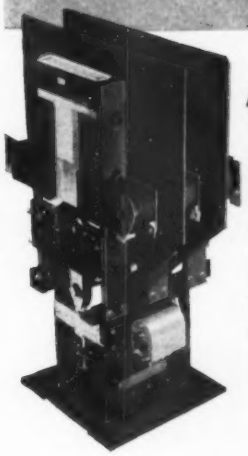
HAZARD *insulated cords and cables*

1443

which contactor meets your needs

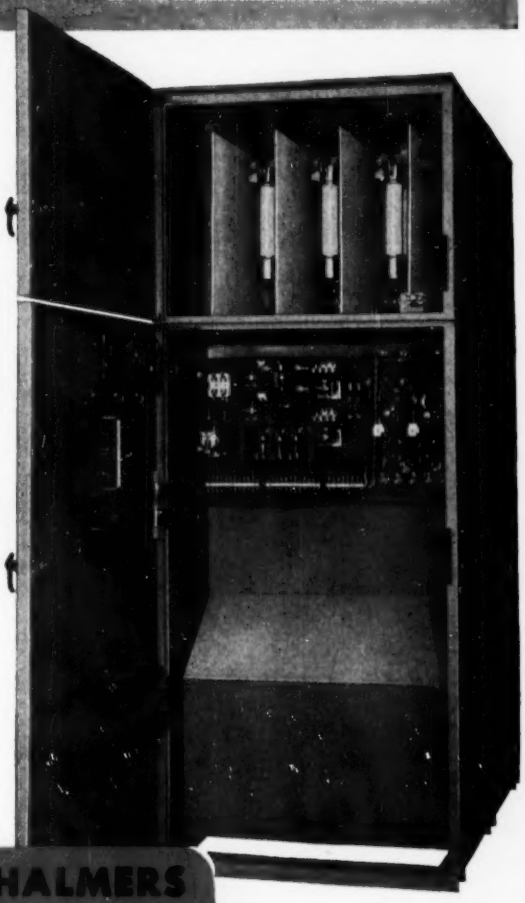
AIR or OIL?

Either may be built into your Allis-Chalmers Type H starter along with meters, overload relays, current limiting fuses, auxiliary switches . . . the coordinated components dictated by your application for complete protection of man, motor and machine.



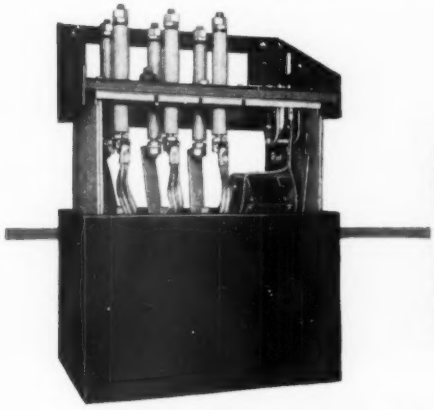
AIR-BREAK CONTACTOR

When the going's rough . . . that's the place for the Type 256 air-break contactor. Frequent starting, inching, reversing or dynamic braking are taken in stride by this rugged performer. And, of course, fire hazard is greatly reduced. No turning shafts, shaft bearings and flexible leads to cause maintenance headaches. Double-break contacts, vertical action and dual blowouts provide long, trouble-free operation.



OIL-IMMERSED CONTACTOR

Got atmospheric troubles? The Type MO oil-immersed contactor will perform heavy duty starting service in dust-laden, corrosive and very moist atmospheres. Contactor is of the time-proved clapper type. Self-cleaning, rolling-wiping action extends contact life. Make and break arcing occurs only on tips. Self-aligning E type magnet provides perfect armature seating . . . long, quiet operation. Permanent windlass tank-lifter simplifies maintenance. A-4103



ALLIS-CHALMERS

Type H Starters

FOR 2300 TO 5000 VOLT MOTORS

Call Your Nearby A-C Representative or Write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 14B6410B.

ALLIS-CHALMERS

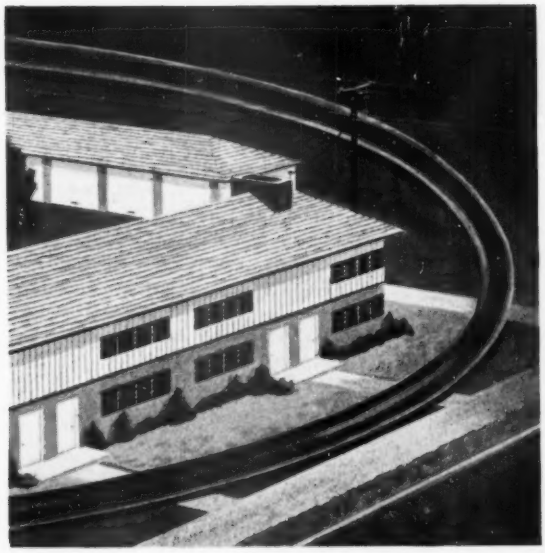
WIRE BY PHELPS DODGE MEANS WIRED FOR LIFE!

Habirshaw Quality Goes Beyond Specification Requirements—is Checked by Exhaustive Controls and Tests!

You can build a better business reputation for dependable, top quality work by specifying Habirshaw building wire—a product of Phelps Dodge Copper Products Corporation. The name "Habirshaw" stands for skilled workmanship and the finest materials, both rigidly controlled and carefully inspected to meet the most exacting specifications—your assurance of trouble-free, continuous service!

See Your Phelps Dodge Distributor!

PHELPS DODGE COPPER PRODUCTS CORPORATION



Dimensional characteristics are continuously checked right on the production line.

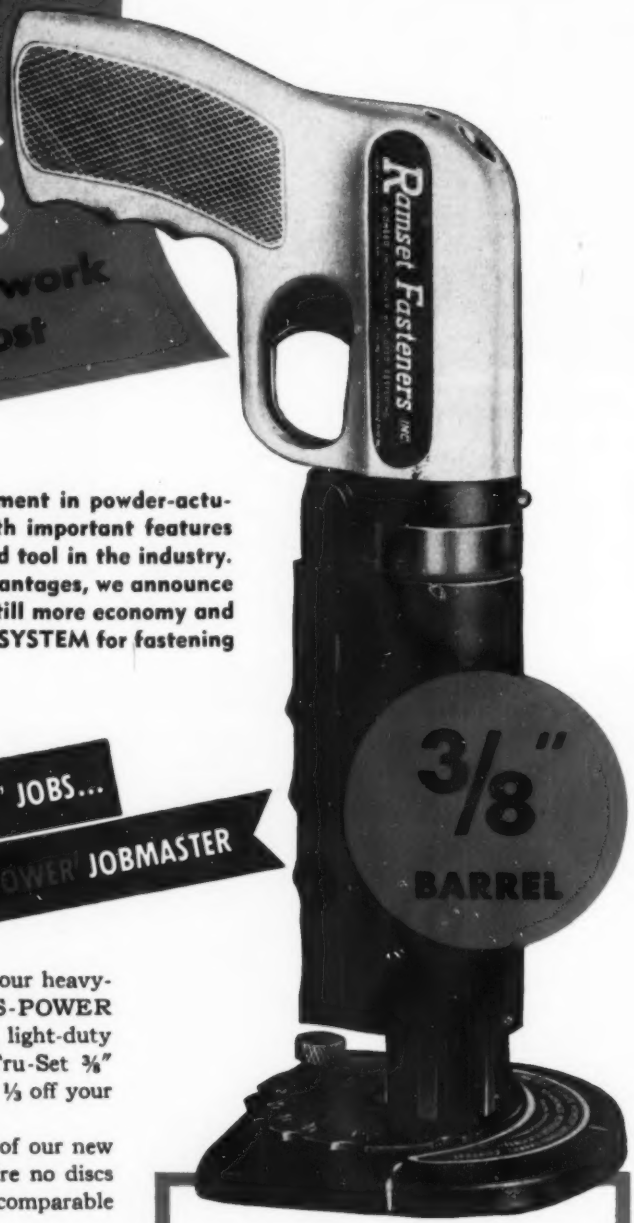
Testing flame-retardant properties of fibrous coverings—one of the many steps in Phelps Dodge's rigid inspection system!

Here's a craftsman with over 35 years of experience devoted to the careful control of quality!

FASTENING COSTS CUT AGAIN!

NEW Ramset PLUS-POWER JOBMASTER

does heavy-duty work at light-duty cost



A year ago, we introduced the newest development in powder-actuated fastening, the RAMSET JOBMASTER, with important features which have helped make it the most widely used tool in the industry.

NOW, with no sacrifice of these valuable advantages, we announce the new PLUS-POWER JOBMASTER, to bring still more economy and versatility to the high-speed, low-cost RAMSET SYSTEM for fastening into steel and concrete.

SAVE 1/3 POWER LOAD COST...

DO MANY MORE "TOUGH" JOBS...

WITH PLUS-POWER JOBMASTER

You can make substantial savings in many of your heavy-duty fastening jobs with the new PLUS-POWER JOBMASTER, with ⅜" barrel. Using lower price, light-duty loads, this new RAMSET Tool will set most Tru-Set ⅜" heavy-duty studs and drive pins, thus cutting ⅓ off your powder load costs.

Further savings are gained through the use of our new Tru-Set ⅜" Flat Head Drive Pins, which require no discs or disc adaptor, and cost considerably less than comparable heavy-duty pins.

Best of all, you obtain these new economies with the same speed, ease and convenience of the standard JOBMASTER which have made it the outstanding favorite for high-speed, low-cost fastening into steel and concrete.

Ask for demonstration . . .

If you now use a JOBMASTER, let your dealer show you the advantages of a plus-power assembly for your present tool. Or, if you use any other powder-actuated tool, or none at all, see how PLUS-POWER JOBMASTER gives you 2-tools-in-1, to drastically cut costs, reduce work and save time for fastening into steel and concrete. Call your dealer or write us for details.

Ramset Fasteners, INC.

Ramset Division, Olin Industries, Inc.

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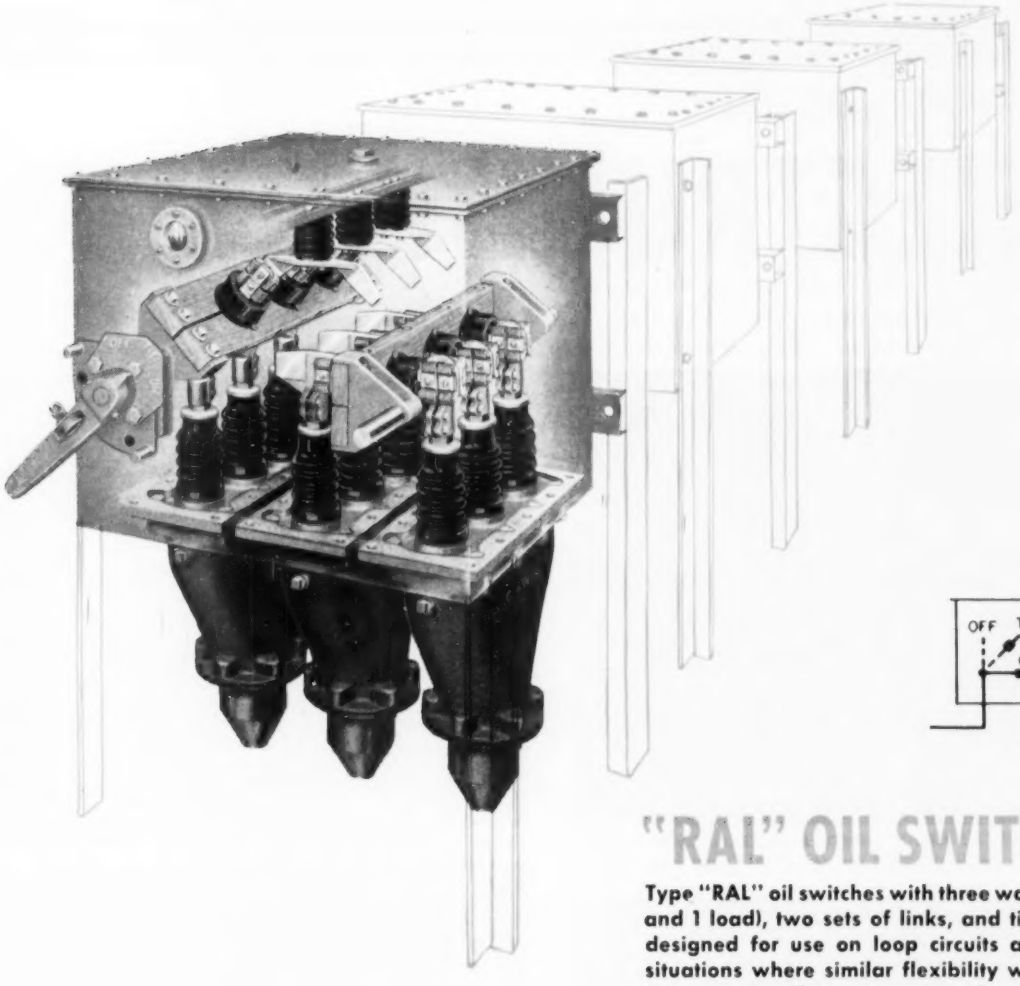
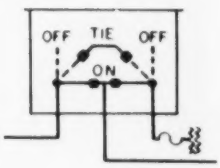
ANOTHER Olin PRODUCT

PROVIDE SAFE SECTIONALIZATION FOR CABLE SYSTEM FLEXIBILITY WITH G & W LOAD BREAK OIL SWITCHES





"RAL" OIL SWITCHES

Type "RAL" oil switches with three ways (2 feeder and 1 load), two sets of links, and tie buses are designed for use on loop circuits and in other situations where similar flexibility would otherwise require three separate oil switches with correspondingly greater expense for equipment, installation, and space.

These oil switches materially reduce the length of time required for restoring service in case of trouble, or for isolating a circuit to make changes. Load break disconnection of a circuit is accomplished by manually operating an external lever —without opening the tank or breaking the oil and moisture seals.

Bulletin DB51 gives complete data and prices. Write for your copy or ask your representative.

G & W "Forethought" DB-20 shows how "RAL" switches are combined with power fuses. Send for your copy, there is no obligation.

G & W ELECTRIC SPECIALTY CO.

7780 Dante Avenue, Chicago 19, Illinois

Cable Terminating, Connecting and Sectionalizing Devices

Representatives in principal cities of U. S. A.

In Canada—Powerlite Devices, Ltd., Toronto and Montreal

Here's On-the-Job Proof

ELECTRUNITE E.M.T.

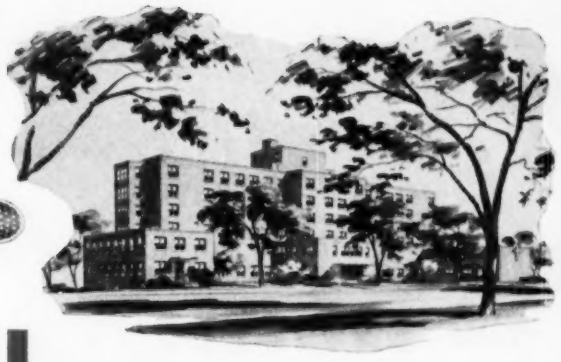
Joining lengths of ELECTRUNITE *E.M.T. is easy. No threads to cut. Easily attached couplings make tight joints.*

Offsets and accurate bends are made right where they're needed, using the handy reference marks on the ELECTRUNITE *bender.*

It's easier to install multiple runs in cramped spaces. Inchmarks on Republic ELECTRUNITE *E.M.T. help make accurate bends to fit in close quarters.*

Previously installed box connectors make it easy to hook up with the raceway system, even for closely spaced runs.

St. Joseph's Infirmary, Atlanta, Ga.
Abreu & Robeson – *Architects*
L. Ralph Bush & Associates – *Electrical Engineers*
Barge-Thompson Company – *General Contractors*
Eckardt-Ness Electric Co. – *Electrical Contractor*



Goes in Easy!

Lengths can be joined without turning the whole run. Because threading is unnecessary, galvanizing remains intact.

Runs are easily lined up with the box location. An experienced journeyman can turn out a neat, symmetrical job.

● There's nothing more convincing than ELECTRUNITE E.M.T. actually being installed. And the pictures on the opposite page are typical of how easy it is.

Journeymen can make smooth, accurate bends. ELECTRUNITE E.M.T. is uniformly ductile. It's "Inch-Marked®". Benders have built-in instructions, are handy to use.

Threadless fittings, connectors and couplings can be used to make tight joints. No need to turn the whole run . . . especially helpful in cramped quarters.

Wire-pulling strain is reduced . . . as much as 30 per cent . . . by the exclusive *inside-knurled* surface of the ½", ¾" and 1" sizes.

All of these features add up to easier, economical installation. ELECTRUNITE E.M.T. is approved by the National Electrical Code for concealed, exposed and concrete installations. On your next project, call your distributor and ask for Republic ELECTRUNITE . . . the "Inch-Marked" E.M.T.

STEEL AND TUBES DIVISION
REPUBLIC STEEL CORPORATION
212 EAST 131st ST. • CLEVELAND 8, OHIO

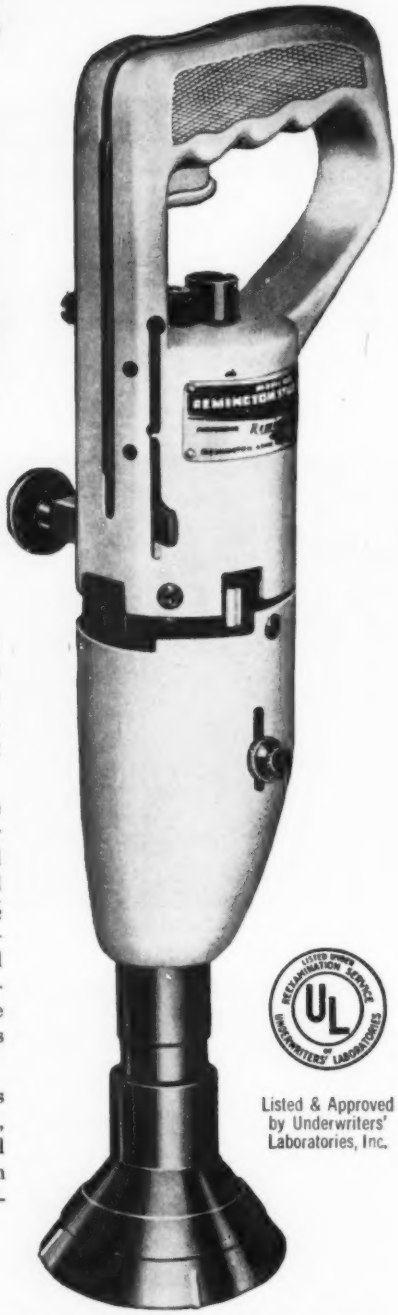
REPUBLIC STEEL

Republic
ELECTRUNITE E.M.T.

You can drive studs ARROW STRAIGHT into steel or concrete with

MODEL 450 REMINGTON STUD DRIVER

The widest power range of any powder-actuated tool!



The Model 450 Remington Stud Driver is the most efficient fastening method in use today. Its exclusive advantages are unequaled by any other powder-actuated tool.

You get consistently straight driving on every type of fastening job with the long heel cap on all Remington cartridges. It acts as a perfect gas seal and provides extra power. These colored heel caps clearly mark the six different 32-caliber power loads that are available. You can select the *right* cartridge for each job quickly and easily.

The Remington Stud Driver needs no separate parts for power control or loading—nothing to lose or break. Just a twist of the wrist opens the Model 450. Insert stud and power cartridge as a unit . . . close and you're ready. Triple safe, this superior tool has a separate lever that must be depressed and *held* with one hand before and during squeezing of the trigger with the other hand. Two *additional* devices prevent operation except in proper fastening position.

Completely self-powered, the Model 450 sets up to 5 studs per minute in fastening steel or wood structural pieces to concrete or steel surfaces. Its light weight—only 5½ pounds—makes it ideal for use overhead or in confined spaces. To speed operation further, an exclusive ejector snaps the fired case out of the tool instantly—no fumbling, no tools needed.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest sporting arms manufacturer.*

Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. ECM-8
Remington Arms Company, Inc.
939 Barnum Ave., Bridgeport 2, Connecticut

Please send me my *free* copy of the new booklet showing how I can cut my fastening costs.

*Name*_____

*Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

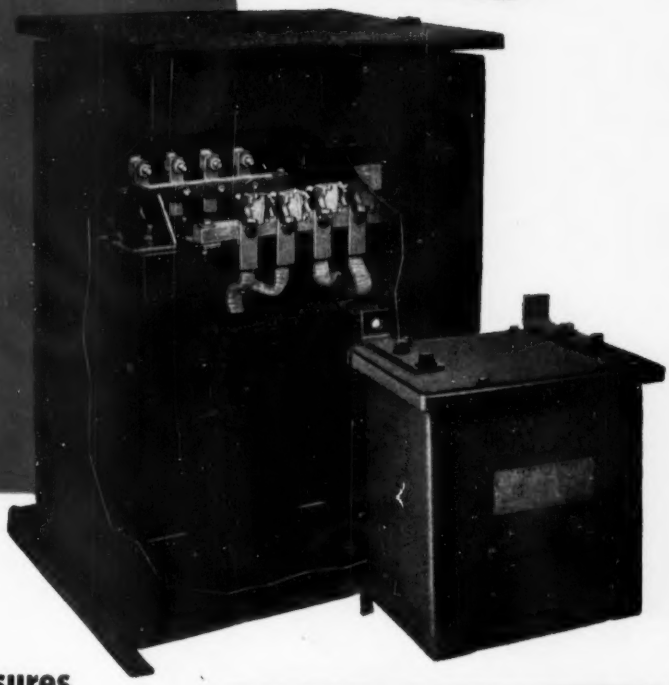
NEW, FREE BOOKLET shows you a hundred different ways the Model 450 Remington Stud Driver can speed *your* construction fastening. Packed with illustrations, it tells you where and how this tool can save time, reduce fatigue and cut costs. Send in the coupon below for your copy.

"If It's Remington—It's Right!"

Remington DUPONT

Compact Design Saves Time

ALLIS-CHALMERS Dry-Type TRANSFORMERS



★ **Simplifies Installation**

★ **Makes Handling Easy**

★ **Eliminates Vaults or Enclosures**

It's easy to install an Allis-Chalmers dry-type transformer. Compact design results in a small, light weight transformer that can be easily handled.

There is plenty of work space in the big, roomy wiring compartment, too, for connecting system cables. Conduit knockouts are provided. Hookup time is reduced to minutes through the use of solderless clamp-type connectors on sizes 15 to 50 kva, inclusive, single phase, and sizes 45 to 112½ kva, inclusive, three phase.

Get These Benefits

All-welded case gives complete protection. No additional enclosures or vaults are required. Surface finish is resistant to corrosion by acids, vapors or moisture. Surface is Spra-Bonderized. Three coats of alkyd-resinous paint are then separately baked on.

Let Allis-Chalmers Class "B" dry-type transformers furnish full voltage at the load. To get complete information, contact your nearby Allis-Chalmers District Office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4034

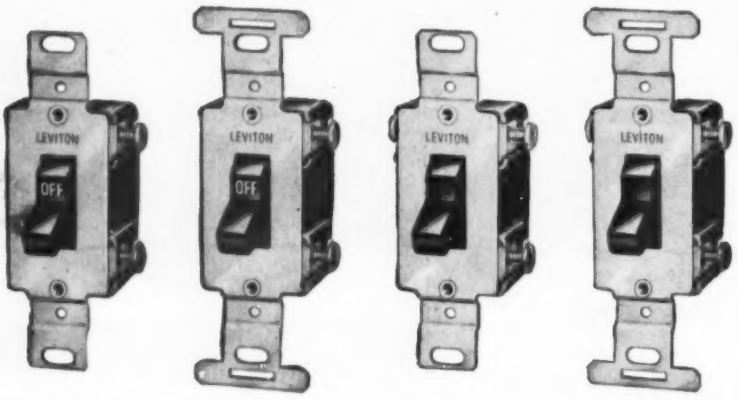
DESIGN ARRANGEMENTS

KVA SIZES		MOUNTING ARRANGEMENT	TERMINATIONS
SINGLE PHASE	THREE PHASE		
3 5 10	9 15	WALL MOUNTING LUGS	BOTTOM TERMINAL COMPARTMENT WITH REMOVABLE FRONT PLATE
15 25	30	WALL MOUNTING LUGS AND BASE FOR PLATFORM MOUNTING	TOP TERMINAL COMPARTMENT WITH REMOVABLE COVER
37½ 50 75 100 167	75 112½ 150 225 300	BASE FOR PLATFORM MOUNTING	TOP TERMINAL COMPARTMENT WITH REMOVABLE COVER

ALLIS-CHALMERS

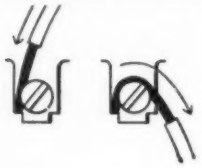
a series of four new toggle switches

the finest switches in their class ... a new, competitively priced line, designed for durable, positive action and long, trouble-free performance.



No. 1230 S. P. | No. 1330 S. P. (with plaster ears) | No. 1231 3-way | No. 1331 3-way (with plaster ears)

showing new easy method of wiring



New features include heavy duty housing with straps rivetted to bakelite cup· large, staked binder head screws backed out for faster wiring, and sturdy, fast-acting mechanism with double wiping contacts.

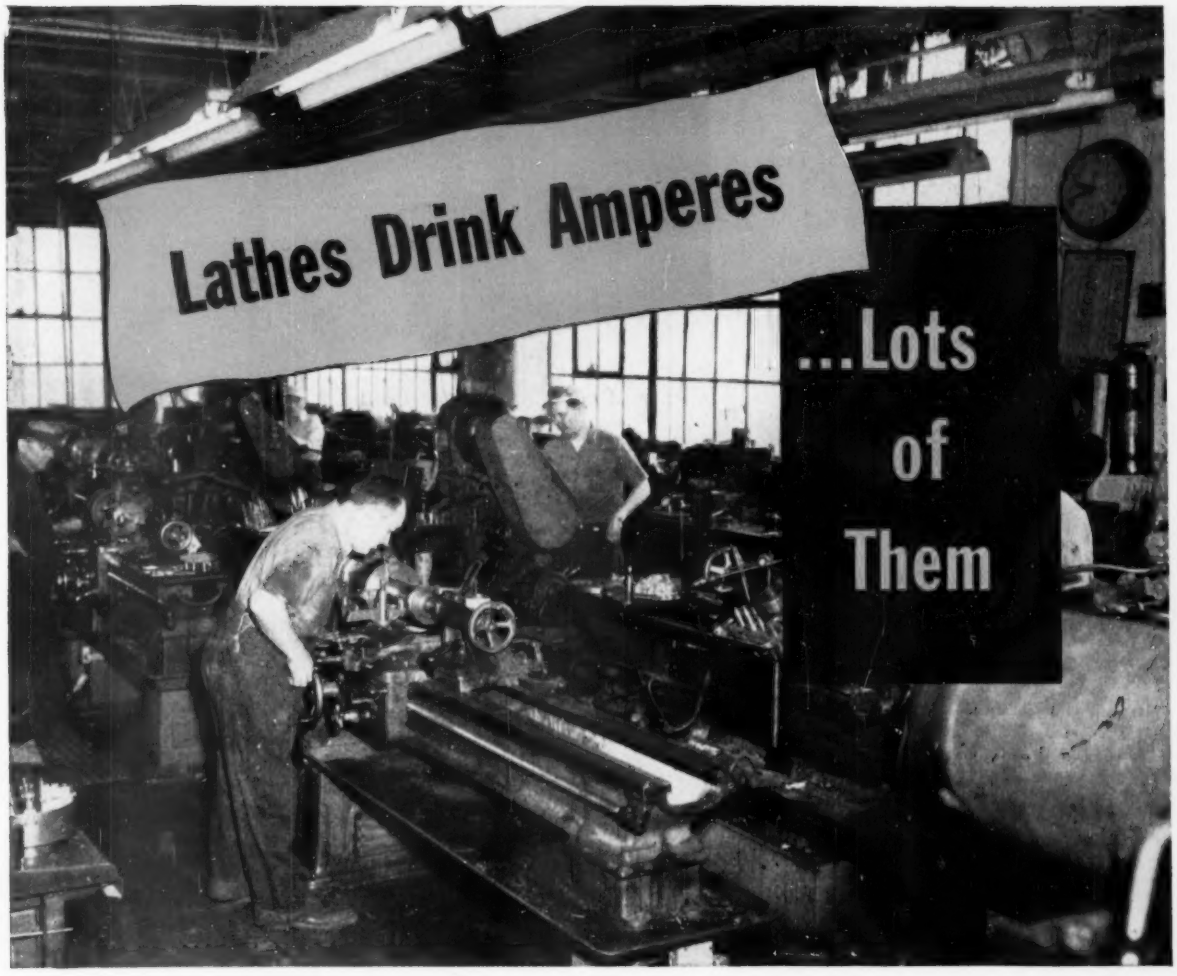
Rated 5A.-250V., 10A.-125V.

Toggles are available in brown or ivory

Built to meet Underwriters Laboratories and Canadian Standards Association specifications

LEVITON

LEVITON MANUFACTURING COMPANY Brooklyn 22, New York • warehouses: Chicago and Los Angeles



Lathes, grinders, milling machines, drill presses and other machine shop equipment use plenty of amperes in their operations. If you slow down or stop these operations, you interrupt production; and when you interrupt production, you interrupt profit.

The power supply of these production tools must be constant. If equipment slows down because of poor wire and cable, work in process may be spoiled. If the production equipment stops, then machine time and labor are wasted.

Simplex-ANHYDROPRENE Wires and Cables are ideal for wiring to machine tools. The neoprene jacket is resistant to oil mist and cutting oils. These wires are light in weight and small in diameter. They are fast and easy to install. Their smooth neoprene jacket permits easy pulling through conduit. They do not have fibrous braids to fray or rot.

Whether you are wiring a small laboratory shop, or a large production shop, use Simplex-ANHYDROPRENE Wires and Cables. You can depend on them.

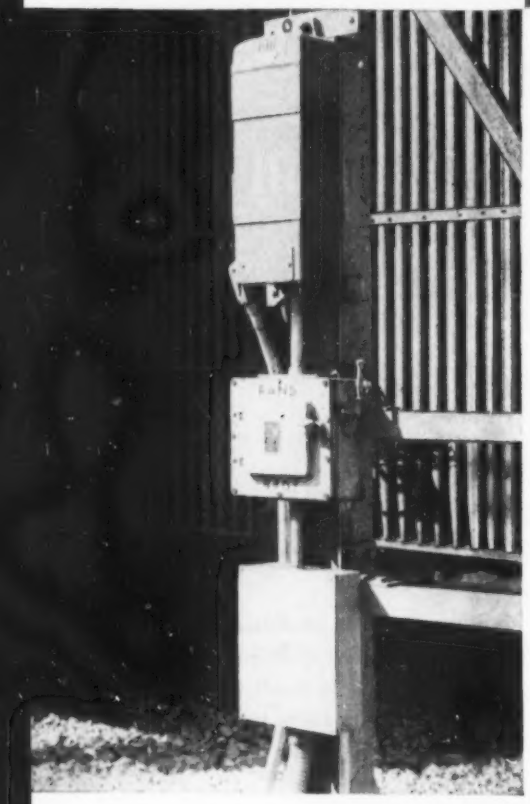
Simplex

WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 Sidney Street, Cambridge 39, Mass.

MACHINE TOOLS. Original equipment manufacturers can help their customers reduce overhead by equipping their products with G-E dry-type transformers to make required voltage changes at the load. At right, electrician installs lightweight G-E Type M in Multi-Slide Machine made by U. S. Tool Company, Inc., New Jersey.

UTILITY. Potomac Electric Power Co., Washington, D. C., uses G-E Type M's outdoors to supply proper voltage at the load for distribution transformer blower fans (below), reports "little or no maintenance" needed.



Cut plant overhead with G-E Dry-type Transformers

Many plants are cutting overhead by curbing power waste. By installing G-E Dry-type Transformers *at the load* wherever machines, lighting, or portable tools require voltage changes, they are avoiding long runs of expensive low voltage feeders, reducing line losses, stretching power dollars.

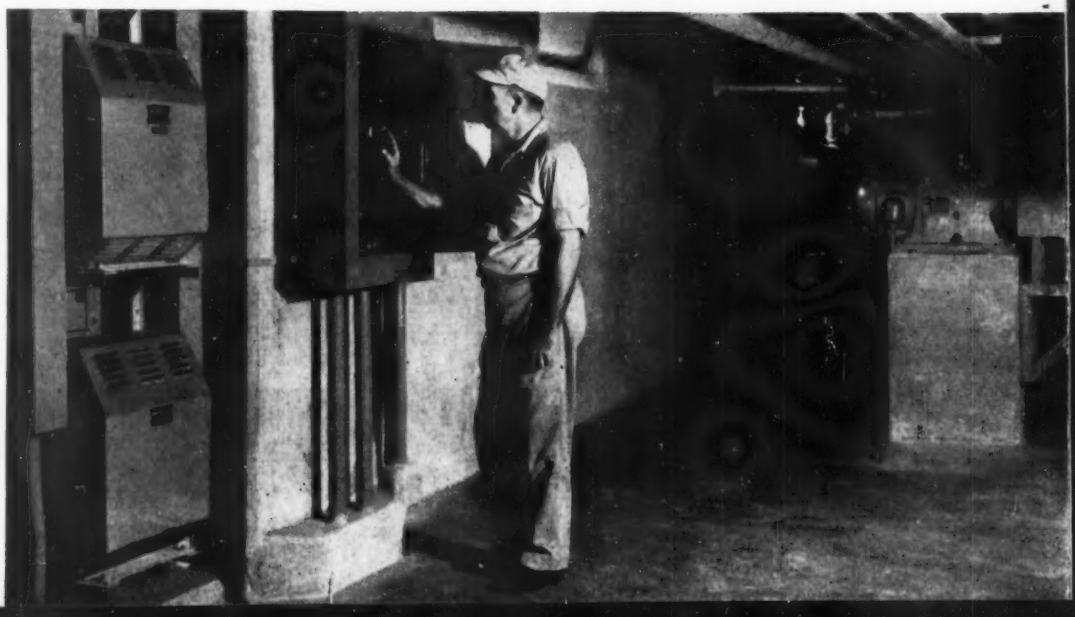
Lightweight G-E Dry-type Transformers are easy to install. You can mount them out of the way on columns, wall brackets or platforms. Designed for efficient cooling, they require virtually no inspection or maintenance.

For more information on how G-E Dry-type Transformers can help you curb power waste and cut overhead in your plant, call your nearest authorized G-E distributor, or write for bulletin GEC-868A, to Section 411-111, General Electric Company, Schenectady 5, N. Y.

You can put your confidence in—

GENERAL ELECTRIC

ROCK PRODUCTS INDUSTRY. The Lone Star Cement Company plant at Maryneal, Texas, stretches power dollars by using G-E Type D's at the load to step down voltage for lighting circuits (right). Type D's, for indoor use, are rated 25 kva and above. Both indoor and outdoor loads can use Type M's (.25 through 15 kva).



For More Than Seventy Years

CRESCENT WIRES & CABLES

Have Played A Leading Role In
The Growth of the Electrical Industry

OVER
70
YEARS
EXPERIENCE

CRESCENT INSULATED WIRE & CABLE CO.
TRENTON, N. J.

GOOD NEWS FOR FLUORESCENT

NOW JEFFERSON
BRINGS YOU A

CONSTANT WATTAGE SERIES BALLAST

WITH

5 Star Performance

JEFFERSON ELECTRIC

RAPID START LAMP USERS!

★ Constant Light Output

Jefferson's new ballast combines the outstanding advantages of constant wattage with the money-saving features of the series rapid start circuit. This gives you positive and quick starts, ideal lamp operation, and constant light output—despite line voltage variations of as much as 20%.

★ 100% Lumen Output

Superiority of design makes sure that you get an average of 100% lumen output — even with the normal voltage variations encountered. This means greater customer satisfaction.

★ Cool Operating

Great efficiency and low watt loss assures you of a unit that meets *all* current specifications regarding this type unit. This is attested to by the Electrical Testing Laboratories' Certification.

★ Completely Safe

With the Jefferson ballast a series circuit is safely *isolated*. This eliminates shock hazard and permits safe lamp replacement when the current is on.

★ Easier Wiring

Rapid Start lamps fit conventional bi-pin holders. There are no starters to wire. And, the new Jefferson unit fits standard rapid start fixtures — no new fixture tooling to worry about.

Jefferson 254-621 ballast is listed by Underwriters' Laboratories.

JEFFERSON ELECTRIC COMPANY
BELLWOOD, ILLINOIS

Catalog No. 254-621
Write For Bulletin 532-11

★★★★★ Jefferson Ballasts ★★★★★

FLEX-A-POWER

Busway Distribution Systems

FLEX-A-POWER means permanent modernity of a building's electrical distribution system — complete freedom to change layout, add or move equipment, rearrange circuits and make building additions at minimum cost. Hundreds of modern plants have adopted it.

Now *Aluminum* Flex-A-Power gives you all the advantages of copper Flex-A-Power, including low voltage drop, *with up to 35% less weight.*

This means easier handling and installation, less expensive hanging, lighter floor loading.

Now the margin of Flex-A-Power superiority is greater than ever. Your Trumbull Distributor, working with Trumbull engineering, can give you authoritative information, prompt quotations and speedy delivery. Call him, or write us for Bulletin TEC-21.

Quick Facts ABOUT ALUMINUM FLEX-A-POWER

***TYPE FVK.** A plug-in busway with power outlets at one-foot intervals, tapped by Flex-A-Plugs of the fusible switch or molded case circuit breaker types. 225-800 amperes, to 600 volts. (3-phase 4-wire 277/480 volt type available in 225 and 400 ampere ratings.)

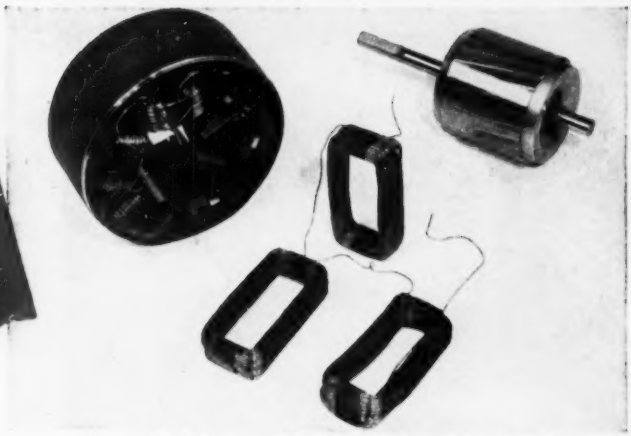
***TYPE LVD.** For high capacity, low voltage drop, feeder applications, or as a riser in multi-story buildings carrying high currents over long distances, 600-4000 ampere ratings, to 600 volts.

*Also available with copper bus bars. Light- and heavy-duty trolley busways available with copper bus bars only.

Listed by Underwriters' Laboratories, Inc.

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.



For Quietness, Efficiency, and Long Life — stators are made from special silicon steel laminations, heat-treated, aligned under hydraulic pressure and solidly riveted. Slot cell insulation is tough Natvar 100% rag paper-varnished cambric, cuffed to fit. Coils are wound from a single length of polyvinyl formal coated magnet wire, eliminating soldered connections. The assembled unit is impregnated with oil and moisture proof varnish and baked in infra red ovens for a permanently sound insulation job.

Are Insulated with
NATVAR
SLOT CELL INSULATION

Marco Industries, Inc., Depew, N. Y. manufactures "quality motors tailored to your product at readymade prices". They are available in 1/100 — 1/8 H.P. range; 4 and 6 pole; 1, 2 and 3 speed; and in open, enclosed, or fan cooled types.

Their quiet, efficient performance in air moving equipment, office machines, pumps, and many other applications is the result of excellent basic design, modern production and test methods, and careful selection of materials. Natvar Slot cell insulation is used because of its uniformly high dielectric strength and resistance to abrasion, oil, and moisture.

If you need insulating materials with good physical and electrical properties, you can depend on Natvar flexible insulation. It will pay you to get in touch with your distributor or with us direct.

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Varnished-lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 22

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

205 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

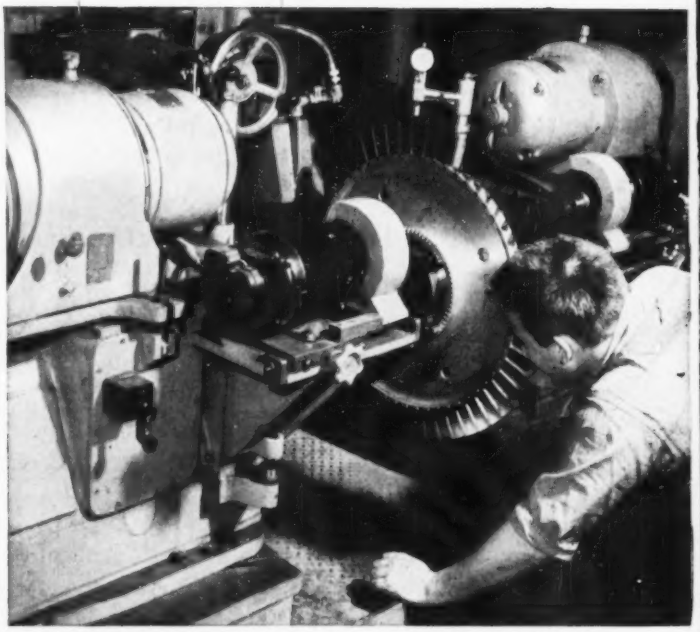
1 QUICK INSTALLATION SAVES YOU MANHOURS when G-E gear-motor is used on compact machines like this soot blower for power plant equipment. Neat, packaged construction permits quick, easy installation in limited space.

2 SIMPLE MAINTENANCE SAVES YOU MONEY. If electrical maintenance is ever needed on this G-E Tri-Clad gear-motor—driving scraper in a grannery—3-piece design will permit stator removal without disturbing gear train.

Save 4 Ways with G-E TRI/CLAD Gear-motors

REG. U.S. PAT. OFF.

3 PROMPT DELIVERY SAVES YOU TIME—assures you of getting the gear-motor you need when you need it. A new multiple point stock plan permits one-week delivery on more than 300 models of General Electric gear-motors.



4 THE "RIGHT" GEAR-MOTOR SAVES YOU TROUBLE on precision operations like grinding jet engine bucket blades. General Electric's wide selection assures you of the correct gear-motor for your particular low-speed application.

For more information about G-E Tri-Clad gear-motors contact your nearest G-E representative, agent, or distributor, or write to General Electric Company, Section 755-12, Schenectady 5, N. Y. for your free copy of new Bulletin GEA-1437H.

GENERAL ELECTRIC

For Maximum Branch Circuit Protection

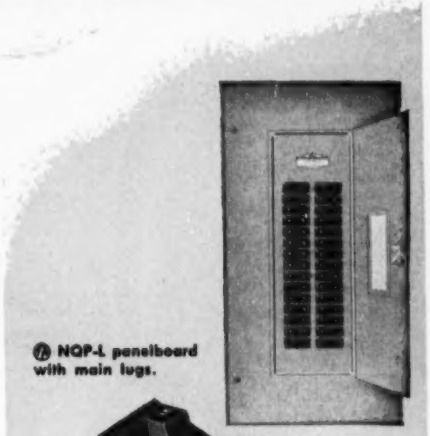
INSTALL NQP QUICKLAG P *Circuit Breaker* PANELBOARDS

THE LATEST Ⓕ contribution to more flexible and efficient branch circuit protection . . . panelboards that are not only safe, dependable, long-lasting and trouble-free but have the added advantage of providing adequately for today's electrical needs as well as future requirements.

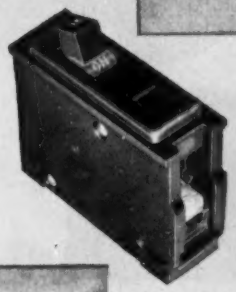
Small and compact, these new and improved panelboards feature the new Ⓕ QP Quicklag P Circuit Breaker with thermal magnetic overload protection and manual or automatic quick-make and quick-break operation.

Ⓕ NQP Quicklag P panelboards are available in eleven sizes of enclosures — six with main lug connection and five for main circuit breaker connection, 50 — 225 amp capacity. These, plus a stock of individually packed single and double pole Ⓕ QP Quicklag P circuit breakers will fit any job requirement. Because all circuit breakers are interchangeable, it is easy as replacing a light bulb to make changes or add new units.

Install these panelboards on all your branch circuits. You'll find that they will virtually pay for themselves in efficiency and service. For additional information, contact your nearest Ⓕ representative, listed in Sweet's or your contractor or wholesaler.



Ⓕ NQP-L panelboard with main lugs.



Ⓕ QP Quicklag P Circuit Breaker.

Ⓕ NQP-AB panelboard with main circuit breaker.

CAPACITIES: 15, 20, 30, 40 and 50 amps; 120 volts, single pole or 120/208 volts, double pole, individual trip; 4 to 42 poles; 120/240 volts, 3 wire single phase or 120/208 volts; 4 wire three phase mains with lugs only or main circuit breaker.

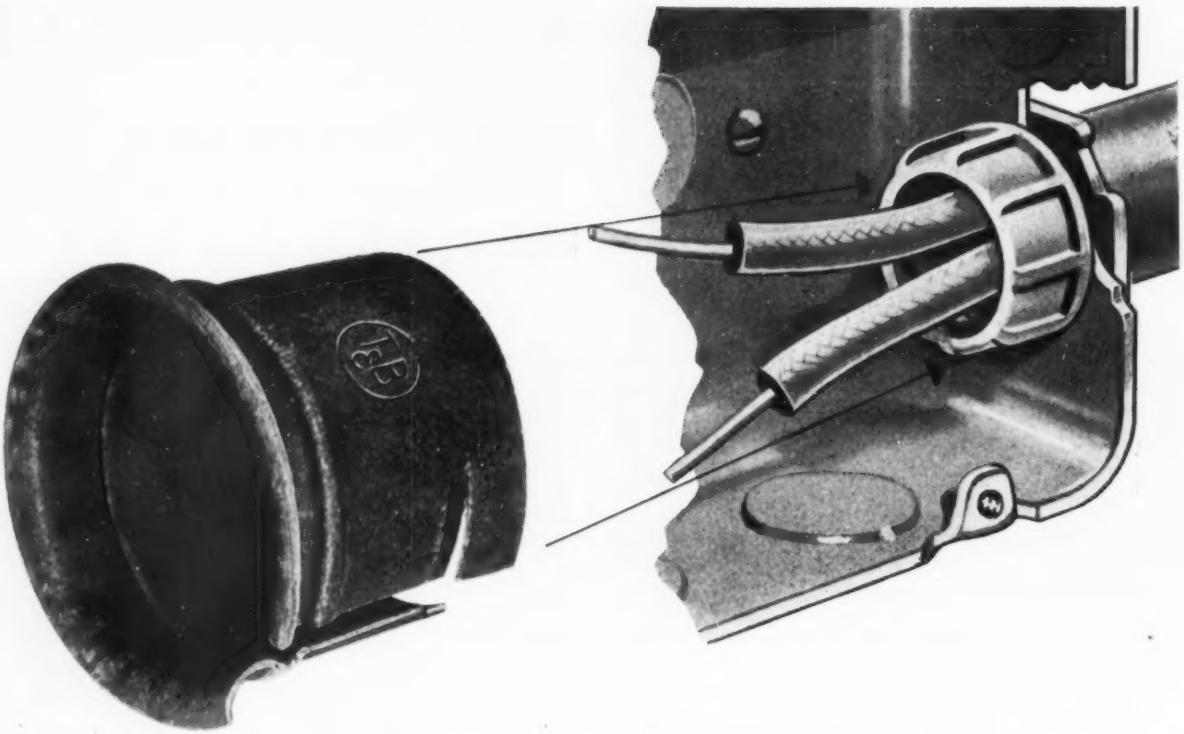
Ⓕ NQP QUICKLAG P FEATURES

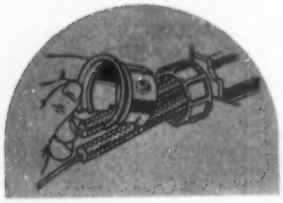
1) **Quick-make and quick-break operation manually or automatically on harmless overloads, short circuits or severe overloads. Handle position indicates "tripped."**
2) **Quick restoration of service simply by moving handle to "off" and then to "on" position.**
3) **Screwless assembly (*just slip breakers in*) with one pressure type connection between circuit breaker and bus bar.**
4) **"Sequence bussing" to balance the load and permit double pole, individual trip combinations.**
5) **Boxes only 14" wide with 4" gutters.**

Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 3, MISSOURI

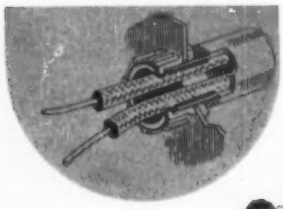
Makers of: BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD-CENTERS • QUIKHETER





Insuliner sleeves slip over cable and snap easily into non-insulated bushings, connectors or nipples — no tools are needed. Available for conduit sizes ½" to 6".

Spring tension holds Insuliner firmly in place. Deep body groove locks behind fitting lip and guards against accidental removal. Long skirt shields conduit end and provides a smooth, insulated interior surface even if the conduit is burred, uneven, or a little too short.



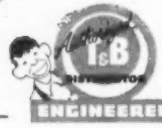
Meet Code requirements with

T&B INSULINERS

. . . and protect cables where they need it most

Ideal for both new or old wiring systems, T & B Insuliners prevent cable abrasion due to burred or unevenly cut conduit or E.M.T. Made of specially-processed fibre, they line and insulate any outlet.

Make it a habit to *always use* T & B Insuliners — you'll wind up with a job that costs less to install . . . a job that gets quick approval from inspectors. Patented T & B Insuliners are Underwriters' Laboratories approved for use under 1951 NEC rules paragraphs 2339, 3009, 3736B. Write for Data Sheet H2 giving complete details. T-313



LOOK FOR THIS SIGN — IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

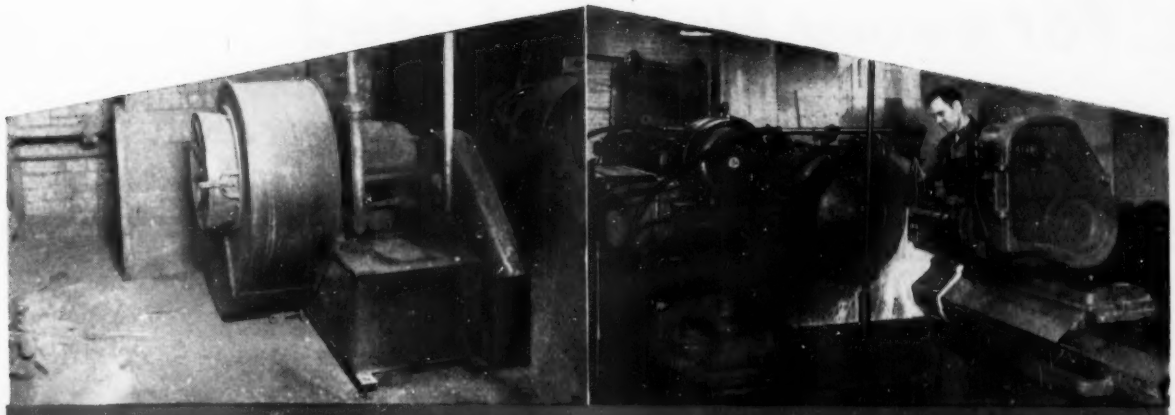
THE THOMAS & BETTS CO.

INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey

Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1898



Century 3 h. p. motor driving a stoker

Century totally enclosed fan cooled motor driving a grinder.

To Cut Down on Your Call-Backs...

Leading Manufacturers Choose

Quiet, dependable Century MOTORS for Heating and Ventilating Equipment

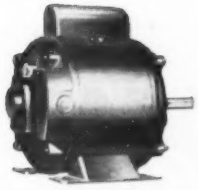
One way to save time and avoid complaints is to make sure the equipment you install has proper motor-power to operate quietly and efficiently.

To assure this customer-pleasing performance, many manufacturers equip their products with Century motors. The wide range of Century motor types and sizes allows them to select motors that are *exactly right* for every job . . . motors that bring out the best in their equipment.

For long-lasting customer satisfaction . . . specify Century C MOTORS

When you see Century motors operating equipment it's a sign that the motor-power is engineered as carefully as the product itself.

CENTURY ELECTRIC COMPANY
1806 Pine Street • St. Louis 3, Missouri
Offices and Stock Points in Principal Cities



Capacitor, Single Phase Motors
⅛ to ½ h. p.

Split Phase, Single Phase Motors
⅓ to ½ h. p.

Open, Drip Proof, General Purpose Motors
400 to ½ h. p.

Splash Proof, Polyphase Motors
400 to 1 h. p.

Repulsion Start, Induction Single Phase Motors
1½ to ½ h. p.

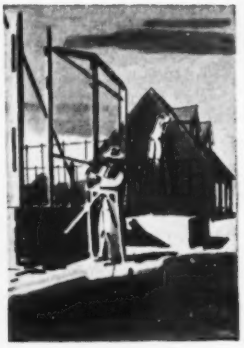
CE-804

For every Electrical need

CHECK General for ELECTRICAL

AUTOMOTIVE - AIRCRAFT

COMMUNICATIONS



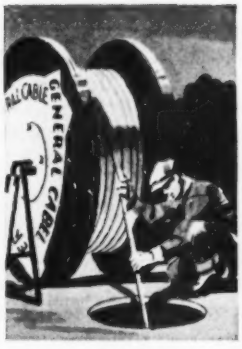
CONSTRUCTION

GENERAL INDUSTRY

MFRS. ELECTRICAL APPARATUS

MINING - EARTH MOVING

MUNICIPAL



POWER

RAILROADS

SHIPBUILDING - SHIPYARDS

GENERAL CABLE

CORPORATION

"More Power to You"

Executive Offices: 420 Lexington Avenue, New York 17, N. Y.
Sales Offices in Principal Cities of the United States

Cable FIRST

WIRE and CABLE

Copper, bronze and aluminum conductors in thousands of different sizes and types of product. Constructions and insulations of every modern variety.

This is General Cable, a *prime source of supply* for everyone who generates electricity, distributes electricity or utilizes electricity.

Whatever your electrical wire and cable need, whenever you need it—say "General Cable" to your purchasing agent, your distributor—or call on the nearest General Cable office.

ONE Source of Complete Supply

ONE Completeness of Service

ONE Standard of Quality

For Quicker Service Anywhere in the United States...General Cable maintains

22 Sales Offices

14 Resident Sales Representative Locations

Over **600** Distributor Sales Locations

6 Regional Stock Distribution Points

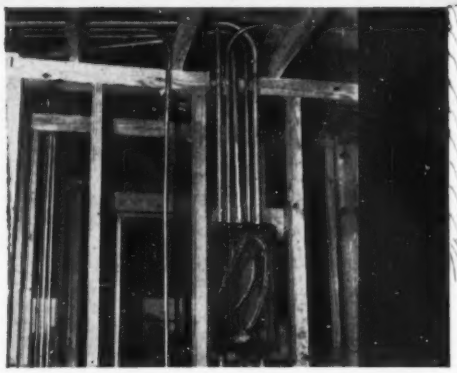
6 Manufacturing Plants and Stocks

Over 200,000 feet of

SPANG® EMT

thin wall conduit with the

SPANGLEAM finish installed in Miami Housing Project



The damp, salty atmosphere and year-around high temperatures of Southern Florida climate place high requirements on the type of EMT thin wall conduit used in construction of new homes and buildings.

For this reason, 205,000 feet of Spang's new EMT thin wall conduit with the SPANGLEAM finish was chosen for use in wiring the new 350-unit housing project at Miami, Florida . . . because the new SPANGLEAM finish, inside and out, assures high corrosion resistance and years of service life.

Specially finished inside with a protective coating of resinous lacquer compounded with Zirconium, SPANGLEAM provides easier wire pulling, assured grounding and corrosion resistance.

Spang top-quality EMT conduit is easy to cut, bend and install . . . it's cleaner, easier to handle, easier to maintain. Ask *any* electrical contractor . . . he'll tell you *why* SPANG EMT thin wall conduit is better!

Spang EMT with the SPANGLEAM finish is available *at no extra cost* immediately in a full range of sizes from ½ inch to 2 inches. See your distributor today—ask for SPANGLEAM.

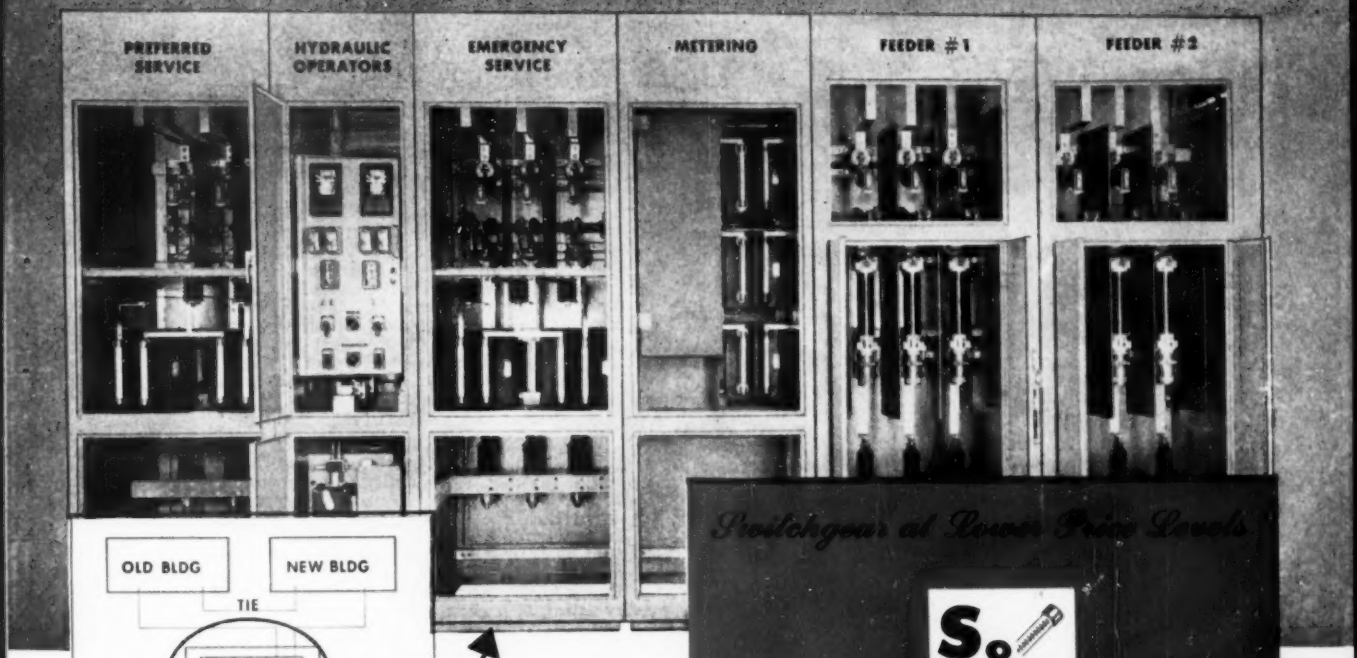
Owner and General Contractor:
Ricmar Builders, Inc.

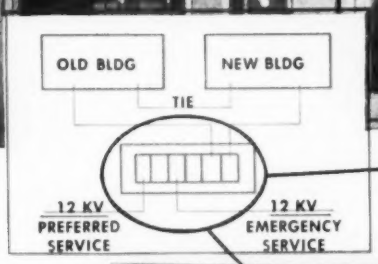
Architect:
Thomas J. Madden, Jr.

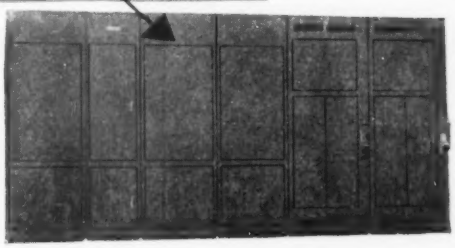
Electrical Contractor:
Tri-City Electric Company, Inc.

SPANG CONDUIT

SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
PITTSBURGH 30, PA.
District Offices and Sales Representatives in Principal Cities







Switchgear at Power Price Levels

S&C

METALCLAD SWITCHGEAR

reduces cost about half for switching centers

When a hospital recently undertook a modernization and expansion program, the enlightened use of this switchgear cut the cost of the switching center in half.

The 6-bay unit was installed to provide preferred and emergency sources of 12,000-volt power (with automatic throwover and return), and metering, plus switching and protection of the outgoing feeders to the load centers in each of two buildings. Secondary circuits are 220-volt 3-phase power, and 120/240 lighting.

The program also involved changing the supply voltage from 4 KV to 12 KV for greater over-all economy.

Scores of installations in a wide variety of industrial plants, public and commercial buildings have demonstrated beyond question that S&C reliability and performance cannot be surpassed . . . and you pay substantially less.

●

If you are planning a new installation, or have the job of modernizing an old one, don't let specifications leave the drawing board without first finding out how S&C Metalclad Switchgear can save you money.

Nearly always it affords the lowest cost way to a thoroughly reliable switching center or service entrance unit. Write for full information today.

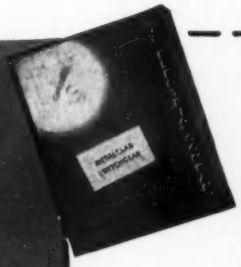
S&C ELECTRIC COMPANY

Formerly Schweitzer & Conrad, Inc.

4433 Ravenswood Ave., Chicago 40, Ill.

In Canada: Power-Vac Devices, Ltd., Toronto

SPECIALISTS IN HIGH-VOLTAGE CIRCUIT INTERRUPTION



S&C Electric Company
4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your new booklet on S&C Metalclad Switchgear. No obligation on my part, of course.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

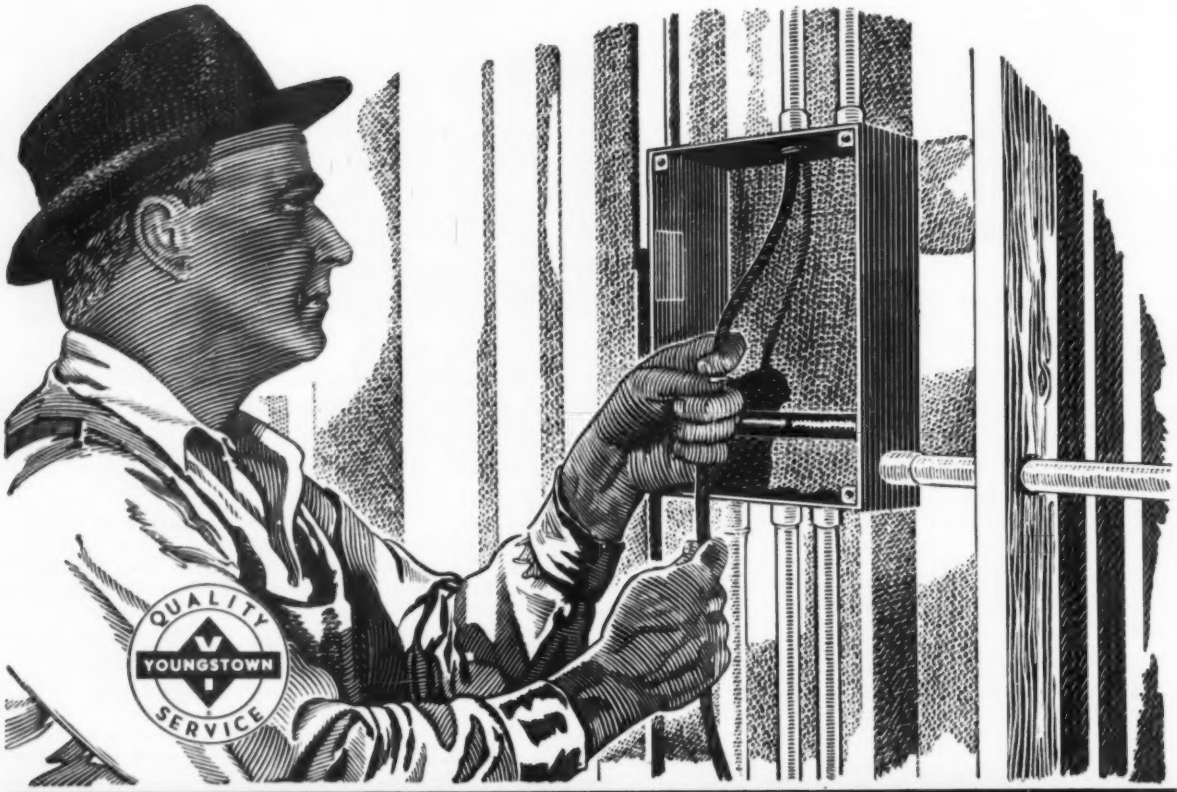
For safety's sake, use smooth Youngstown Buckeye Conduit!

Youngstown manufactures full weight rigid steel electrical conduit from start to finish. There are many substitutes for rigid steel conduit, none possess all the overall safety features essential to permanent protection. On your next job, be 100% SAFE—be sure you get Youngstown Buckeye conduit.

HERE'S A CONTRACTOR WHO DOESN'T TAKE CHANCES: "I'm never safe with conduit that dents, cracks or breaks easily and damages my wiring. That's why I always use Youngstown Buckeye rigid steel conduit. Its smooth interior finish protects wires when pulled and its tough exterior of high quality rigid steel withstands hard treatment."

APARTMENT OWNER SAYS THIS: "As a landlord, I've got to look into every angle for the safety and protection of my tenants. That's why I insist on Youngstown Buckeye rigid steel conduit to protect wiring. Buckeye is an investment that discourages amateurs and kids from fooling with wires. In my 25 years as a landlord, Buckeye has proved its value in resisting corrosion, dust and moisture."

Shipments of Buckeye rigid steel conduit are now being made from our conduit mills at Indiana Harbor and Youngstown.



THE YOUNGSTOWN SHEET AND TUBE COMPANY

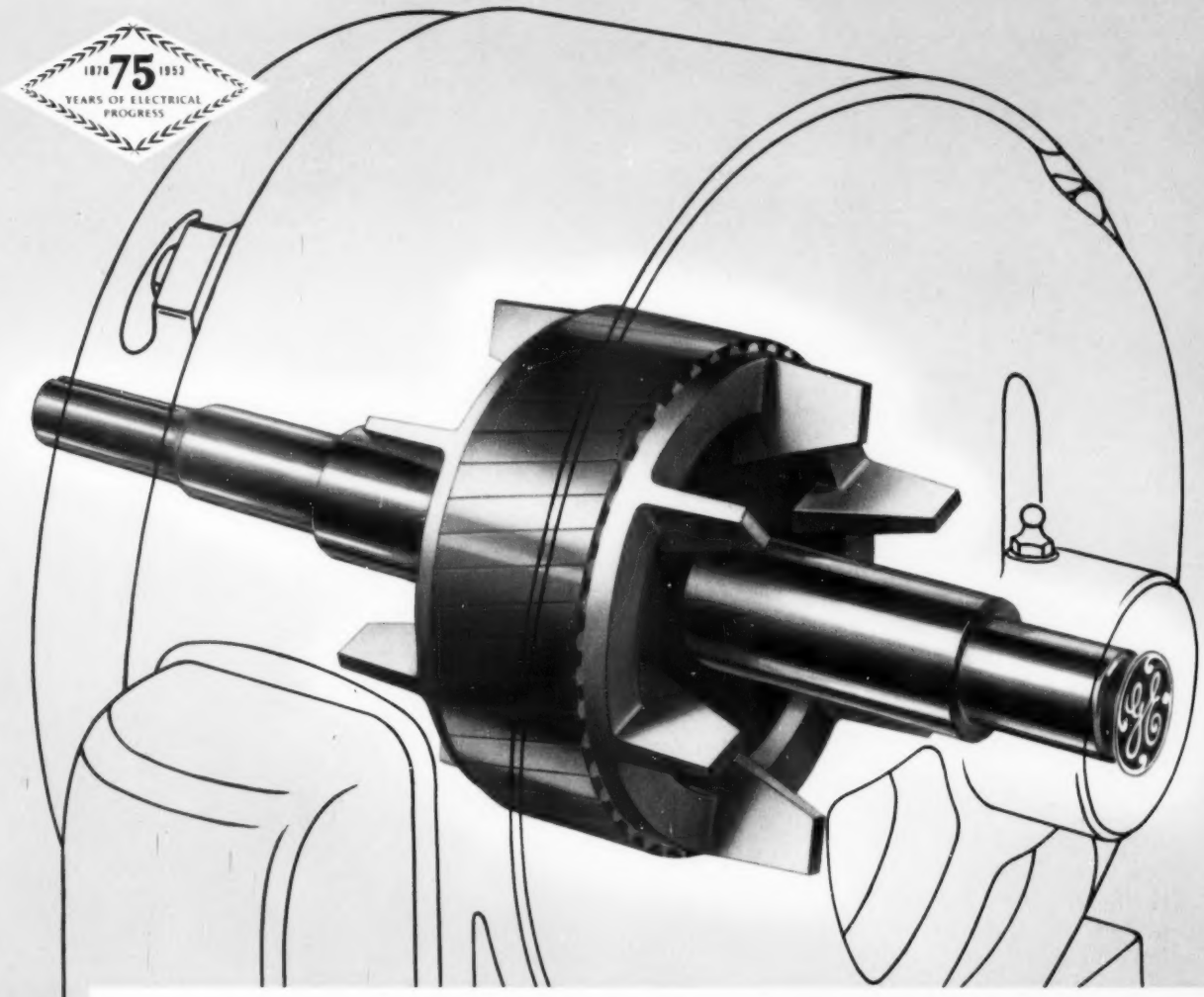
General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel

Export Office - 500 Fifth Avenue, New York

COLD FINISHED CARBON AND ALLOY BARS - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - PIPE AND TUBULAR PRODUCTS - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES.

1878 75 1953
YEARS OF ELECTRICAL PROGRESS



Why rotors don't fail in G-E TRI CLAD motors

G-E pioneering and research developed and produced this one piece cast-aluminum rotor winding, which has virtually eliminated rotor failures in Tri-Clad motors.

Rotor is indestructible in service because the bars, end rings, and fans are a "one-piece" casting. No brazed joints, no fabricated fans to come apart.

Rotor inertia is reduced by the lightness of the aluminum, thus raising efficiency and allowing easier starting, stopping and reversing.

Rotor efficiency is higher, operating losses reduced, as the result of a special chemical treatment.

The motor runs cooler because the integrally cast fans dissipate heat faster.

Operation is smooth and quiet due to the dynamic balancing of the rotor which also reduces bearing wear and material fatigue.

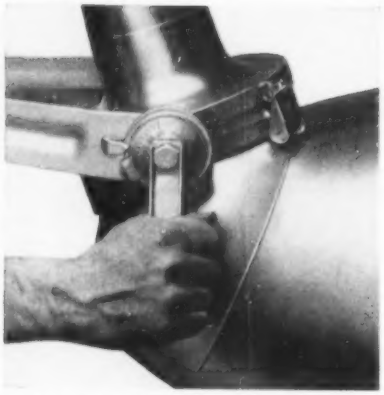
Long rotor life is one more reason why G-E Tri-Clad motors last longer — give you more reliable service and greater operating economy.

Order Tri-Clad motors today from your nearby G-E representative. You'll find popular models in stock. General Electric Co., Schenectady 5, N. Y.

752-20

You can put your confidence in—

GENERAL ELECTRIC



1 NO TOOLS required for initial positioning or maintenance with built-in wrench-type handle. Large area clamping action holds against vibration.

2 EASY AIMING is possible even during daylight with G-E L-69's convenient beam sight ... puts the light in the right place, cuts down on installation time.

3 EASY CLEANING to remove particles in case of lamp breakage is possible as the reflector tips over completely. No tools required for the operation.

5 reasons why G-E L-69 Floodlights cost you less to install and maintain

EASY INSTALLATION. You save money by saving time when you install economical G-E Type L-69 1500-watt Floodlights. From the simple two-bolt mounting to the convenient beam sight for fast daylight aiming, the lightweight G-E L-69 is designed so that it will cut your costs by simplifying your installation.

ECONOMICAL MAINTENANCE. Built-in wrench type handle on the G-E L-69 completely eliminates the need for tools. Both relamping and cleaning are fast and easy, and the G-E L-69 delivers more light per unit, more light per watt, than any other comparable lighting unit.

LONG LIFE. The G-E L-69 is constructed completely of aluminum and other non-corrosive metals which will stand up under all weather conditions. This long life construction will save you and your customers money, because it costs you less to maintain these floodlights. With the G-E L-69 you can do a quality lighting job that will pay off in more lighting business for you.

PROMPT DELIVERY. You can get the G-E L-69 right out of distributors' stocks at shipping points throughout the country. There's a light in G.E.'s complete line of open and enclosed floodlights to precisely fit your needs whatever your lighting requirements are. And if you need help, you can get it from G.E.'s staff of lighting specialists.

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

USEFUL INFORMATION is yours for the asking. NEMA approved floodlighting plans for all sports are contained in GET-1284; effective industrial uses are explained in GEA-3640D; and Bulletins GEC-533B and GEC-919 give complete details on the L-69 sports and area floodlight. Just write Section 451-183, General Electric Company, Schenectady 5, New York.

You can put your confidence in—

GENERAL ELECTRIC

4 LESS BREAKAGE with spun-on, impact resisting tempered plate glass, which won't break if struck by ball, and keeps water, dirt and insects out permanently.

5 EASY RELAMPING. Flick hand toggle latches, clamp socket housing to trunnion bracket. Hands are free to service light. Reflector need not be disturbed.

SQUARE D *Reduced Voltage* STARTERS

One of these 4 types will meet your requirements . . . best

- Is minimum motor current inrush your primary consideration?
- Is it reduced starting torque? Or maximum smoothness in acceleration?
- Is cost an important factor?

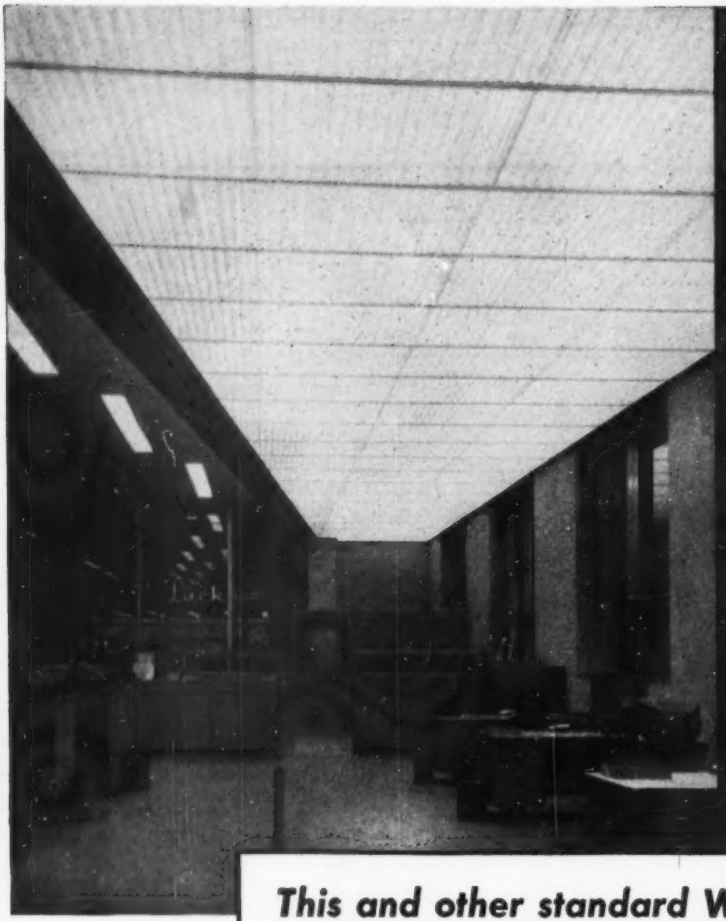
With these four types Square D can meet any reduced voltage starter requirement—exactly.

***Write** for Reduced Voltage Starter Bulletins. They give complete details.*
Address Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

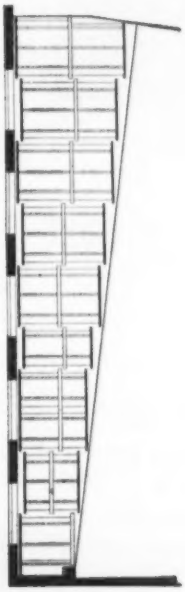
SQUARE D COMPANY

1903 • 50 YEARS OF DESIGN LEADERSHIP • 1953



This unusual non-rectangular installation shows flexibility of the WAKEFIELD CEILING

This and other standard Wakefield Ceilings can be priced on the job . . .



Here in this attractive bank installation the adaptability of the Wakefield Ceiling is apparent. A trapezoidal area is handled as readily as any normal rectangular area. Installation is simple because a standard Wakefield channel system is used above the Plexiglas diffuser. Note how advantageously fusion strips have been used under the rows of lamps to give extra shielding. Area is 1080 sq. ft. with 50 ft. c. maintained (walls of 50% and floors of 30% reflectance).

Though the Wakefield Ceiling in this installation is limited functionally to the provision of efficient lighting, it could have been furnished with acoustical baffles for sound control and further utilized as a means of air diffusion. The price of a Wakefield Ceiling can be figured by Wakefield representatives from plans or on the job anywhere. The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada, Wakefield Lighting Ltd., London, Ontario.

Wakefield Over-ALL Lighting

WAKEFIELD GEOMETRICS · THE CAVALIER · THE GRENADIER · THE PACEMAKER · THE COMMODORE · THE STAR · THE WAKEFIELD CEILING

EASY

TO BEND . . . flexible and strong

TO CUT on the job

TO HANDLE . . . free stripping

COLUMBIA

A.B.C. Armored Cable

The Safe, Economical, Grounded, Steel Covered Wiring System

Flexible, strong and easy-to-handle, Columbia A.B.C. Armored Cable is galvanized to resist corrosion. Rubber covered conductors mean safe, dependable wiring. And, Columbia gives you the kind of service that keeps your jobs "on-schedule."

Approved by Underwriters Laboratories

Columbia CABLE & ELECTRIC CORP.

Serving the Electrical Wholesaler Since 1912

255 Chestnut St. **Brooklyn 8, N. Y.**

Sales Representatives in Following Cities:

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Boston, Mass.
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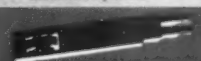


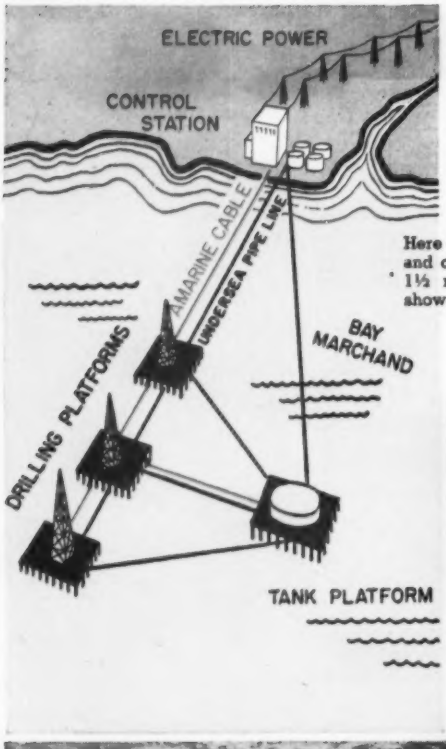
NON-METALLIC SHEATHED CABLE

FLEXIBLE STEEL CONDUIT

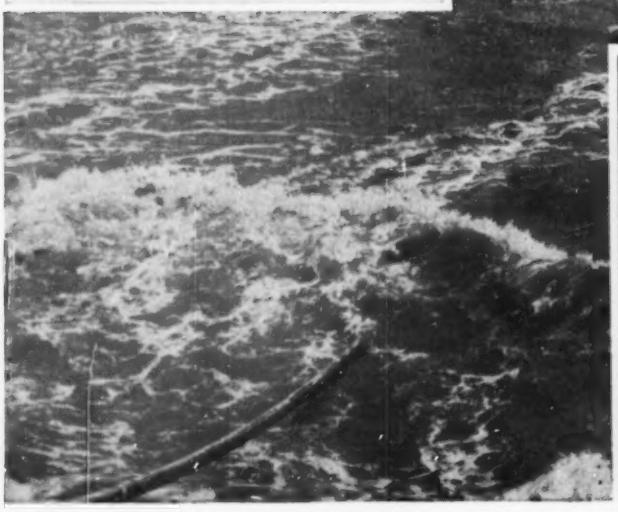
E. M. T.

A.B.C. ARMORED CABLE

The first case 4 miles of powers



Here is layout of drilling platform and cable supply. Rig D is about 1½ miles from shore. Red line shows cable connections.



Anchoring cable on shore. Power is supplied at 13,800 volts. Entire cable is armored with galvanized mild steel wire to provide strength, resist abrasion.

Pulling cable onto first platform. Each of the three conductors is covered with PS Shielding to eliminate corona discharge.

AMERICAN STEEL & WIRE DIVISION
USS
TRADE MARKS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

A STANDARD CABLE FOR

▼ asbestos wire and cable ▼ shovel & dredge cable
▼ paper & varnished cambric cable
▼ aerial, underground & submarine cable

U·S·S AMERICAN ELECTRICAL

of its kind...
Amarine Submarine Cable off-shore drilling rig

• It isn't easy to operate an off-shore drilling rig in the Gulf of Mexico. Fog, northwesters and water spouts are common hazards. Hurricanes are the worst of all.

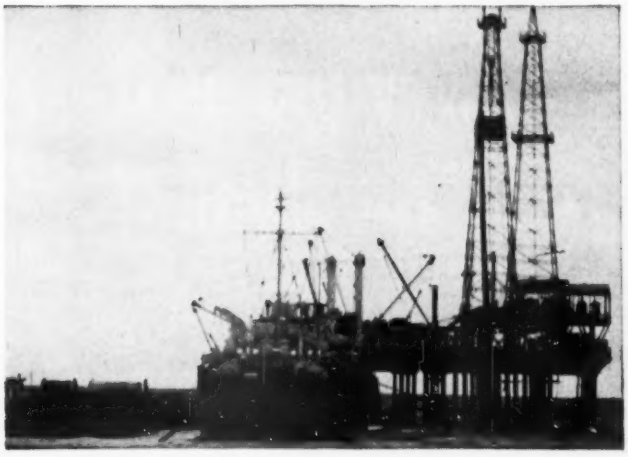
In the face of these difficulties, the California Company brought in 10 producing wells a mile or more from shore. A converted LST supplied power to the pumps—but it was vulnerable to bad weather and it was needed elsewhere, for other drilling operations. What was needed was a *reliable* way to get commercial power out to sea.

American Steel & Wire designed a special non-leaded 3-conductor submarine cable that transmits some 2,500 horsepower to the drilling platforms. In just a single day, it was carried out to the first platform. It is totally unsupported, and lies on the bottom of the Gulf, safe from wind and sea. Now the pumps are operated round the clock with reliable shore power.

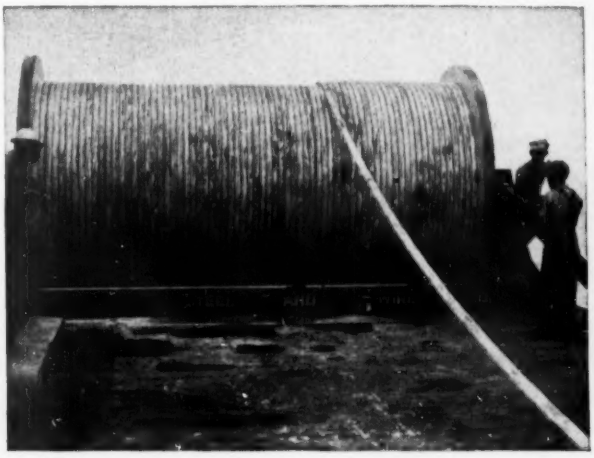
It's the tough jobs like this that have made U·S·S Amarine Submarine Cable famous. And remember, too, that you can get a standard U·S·S American cable for every special job, whether it's for a mining locomotive, dredge, power shovel or a hand-operated electric drill.

AMERICAN STEEL & WIRE DIVISION
UNITED STATES STEEL CORPORATION
GENERAL OFFICES: CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK



Here is typical rig. Notice LST in center, cable barge at left. Cable contains three pairs of telephone wires to communicate between drilling rigs and shore.



Cable was shipped on two reels—12,970 feet on one, 6,500 on the other. We have shipped another 6,000 feet of same cable to join new drilling rigs.

EVERY SPECIAL JOB!

▼ mold cured portable cord
▼ machine tool & building wire
▼ special purpose wire & cable

WIRE & CABLE USS

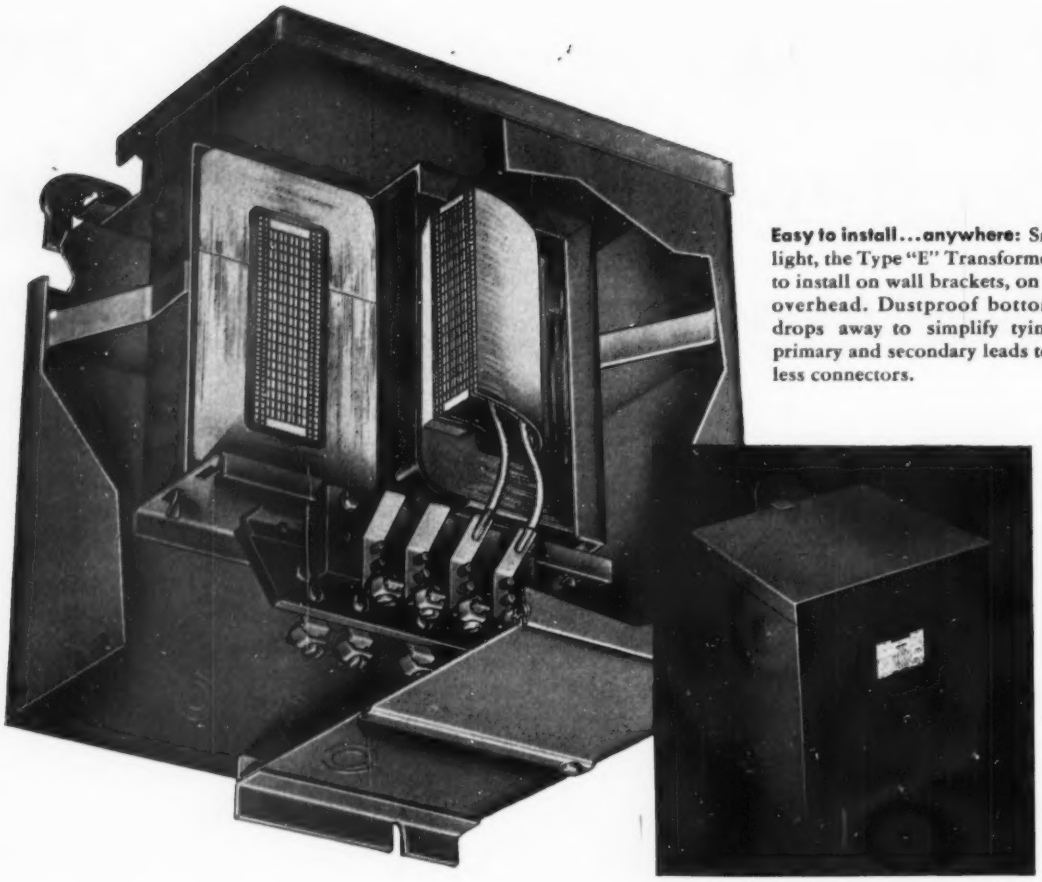
UNITED STATES STEEL

SEND THE COUPON

American Steel & Wire Division
Room AE-83 Rockefeller Building, Cleveland 13, Ohio

☐ Please give me more information on U·S·S Amarine Submarine Cable.
☐ Have representative call.

Name.....
Title.....
Company.....
Address.....
City.....State.....



Easy to install...anywhere: Small and light, the Type "E" Transformer is easy to install on wall brackets, on posts, or overhead. Dustproof bottom panel drops away to simplify tying in of primary and secondary leads to solderless connectors.

NEW totally-enclosed dry-type transformers ...safe, economical for dusty areas!

Here's a problem that the new Westinghouse Type "E" was designed for:

If you've been forced to mount transformers outside your plant away from lint, dirt or dust-laden areas, you've paid a high price for power . . . because long secondary runs cause excessive line losses and poor voltage regulation.

Now, you can install new Westinghouse Type "E" Transformers close to the machines they serve. By shortening secondaries, you improve regulation, get increased production for your existing equipment.

Since the Type "E" is a totally-enclosed and non-ventilated dry-type transformer, it is suitable for all but the most hazardous or explosive conditions. Through the use of Class H insulation, it is small and light . . . easy to install anywhere.

You'll find Westinghouse Dry-Type Transformers offer an economical answer to your electrical distribution problems. The Type "E" is available from 3 to 22 kva, single phase, 600 volts and below. Further information is contained in booklet B-5812. Get a copy from your Westinghouse representative, or write to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70691

YOU CAN BE SURE...IF IT'S

Westinghouse

NEW

You need it! Send for free copy today!

United States Rubber Company, the only electrical wire and cable producer to grow its own natural rubber and to manufacture its own plastics and synthetic rubber, makes a complete line of electrical wires and cables for every industrial and domestic application. Just published is the 1953 "U.S." Catalog, essential for men who specify, install or maintain electrical wire and cable. Send for your free copy to address below. Here are the catalog chapter headings:

1. U.S. Royal Portable Cords and Cables
2. U.S. Railroad Wires and Cables
3. U.S. Power Cables
4. U.S. Control and Signal Cables
5. U.S. Building Wires and Cables
6. U.S. Bare and Weatherproof Wires
7. U.S. Flexible Cords and Cord Sets
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"U.S." Research perfects it...

"U.S." Production builds it

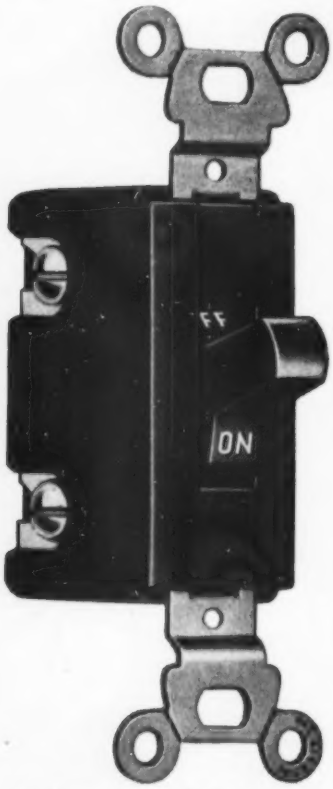
U.S. RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

ELECTRICAL WIRE AND CABLE DEPARTMENT • Rockefeller Center, New York 20, N. Y.

NEW A. C. SWITCH LINE

THE ANSWER IS BRYANT



15 Amperes 120 Volts—A. C. only
15 Amperes 277 Volts—A. C. only

APPLICATIONS

. . . the 4801 line can be operated to their full rated capacity for the control of Incandescent and Fluorescent (inductive) lighting loads.

. . . rated at 277 Volts, these switches are listed and approved for all types of loads at this voltage.

. . . for control of motors with current ratings up to 80% of switch rating.

Bryant announces a new line of quality switches for A. C. operation only. The 4801 line meets all specifications and is another addition to the full Bryant wiring device line for home, office and industry.

Look at these features of this new line:

- Rugged, compact plastic body.
- Fine silver contacts for long-life.
- *Totally* enclosed mechanism.
- Quiet operation . . . for installation where minimum switch noise is desirable.
- Concealed yoke with washer type ears.
- Screw clamp terminals for easy wiring . . . straight-in from back, or conventional side wiring. Large head terminal screws accommodate up to No. 10 wire, solid or stranded.
- Handy wire strip gage.
- Available in Single Pole, Double Pole, 3-way and 4-way with Brown or Ivory handles.
- Takes standard switch boxes and standard switch plates.

Listed by Underwriters' Laboratories, Inc.

THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

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BRYANT
SUPERIOR WIRING DEVICES

Specify Bryant from Your Electrical Distributor

1-99894

30% GREATER CONTACT TRAVEL

With NEW KEYSTONE LMI PONY SIZE COLLECTORS

New advantages . . . new economies . . . are now offered with the Keystone LMI Pony Size Collectors! These new collectors are designed for continuous, efficient performance despite severe operating conditions. Outstanding advantages include: improved contact shoe, readily reversible, provides 30% greater contact travel, adds 300% more wearing thickness on each side, lower in overall height.

Solderless throughout, shunt connectors have non-loosening electrical connections. Copper plating on machined surface insures better electrical contact where shunt is connected and prevents corrosion. Maintenance simplified. Only one tool required.

The new Keystone LMI Pony Size Collectors last longer . . . help you reduce inventories and give improved service. For complete information ask for Bulletin 681B. Write today.

OUTSTANDING FEATURES

- 30% greater contact travel
- Improved contact shoe
- Efficient current transfer
- Solderless shunt connectors
- Rapid contact reversal
- Compensating terminal
- Lower overall height
- Collector reversible
- Easy to maintain

ELECTRIC SERVICE MANUFACTURING CO.

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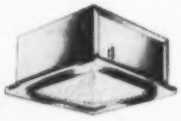
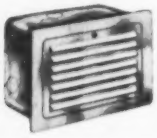
MANUFACTURERS OF COMPLETE LINE OF INSULATOR SUPPORTS FOR RAIL AND WIRE CONDUCTORS AND CURRENT COLLECTION DEVICES.

DERBY DOWNLIGHTS—Endless applications. 7″ diameter recessing downlights, available with matt black removable louver or with Holophane Controlens*. UL approved.



DUO-FRAME UNITS—Recessing units with Holophane, Corning, and Phoenix glassware. Two-piece frame. Drop hinges. Vertical and horizontal lamp mounting units. UL approved.

EXIT SIGNS—Surface, recessing, top and end mounting units. Metal stencil sign faces, backed by red glass. HOT-BONDED lustre aluminum finish. UL approved.

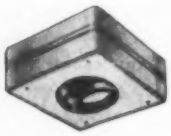


NITE LITE—One-piece, die-drawn recessing box. Louvered face with concealed hinge for easy servicing. Stainless steel or baked lustre aluminum finish. UL approved.

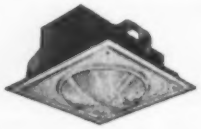
BED LAMP—Direct-indirect hospital unit. For three 50/60 watt lamps. Stainless steel finish. Controlens* panel in bottom, diffusing glass in top. UL approved.

PLEXOLINE® ACCENT UNITS—For use singly or with PLEXOLINE linear units. Adjustable and fixed units. Louvered body provides spill light on sides. UL approved.

TROFFER ACCENT UNITS—Self-contained square recessing units, adjustable or fixed, flange or snap-in type. May be used singly, within or at end of troffer runs. UL approved.



SURFACE MOUNTED ACCENT UNITS—Adjustable units or fixed units with Holophane Controlens*. May be used singly or with VIZ-AID® or LENOX® fixtures. UL approved.



RECESSING CORRIDOR UNITS—Available with two optical characteristics: asymmetric and symmetric. Flange or snap-in. Holophane* prismatic glass globe. UL approved.

*® HOLOPHANE CO., INC.

A complete line of incandescent units by Day-Brite

When the name "Day-Brite" is mentioned, you think of the nation's finest line of fluorescent fixtures. This is to remind you that there's an equally fine line of Day-Brite incandescent units—giving you the advantages of Day-Brite quality and design for every piece of equipment called for in any type of lighting job. Write for full descriptive product information on the Day-Brite incandescent line. You'll find it a valuable addition to your files.

"DECIDEDLY BETTER"
DAY-BRITE
Lighting Fixtures

Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Mo.

In Canada: Amalgamated Electric Corp., Ltd., Toronto 6, Ontario

373

FOR any type connection, straight splice, Tee's, Y's, crosses, etc, of any size, #8 wire through 3000 MCM cable. Also bus, tubular bus or any electrical connection of copper to copper or copper to steel.

why?

1. Greater current carrying capacity than the cable itself.
2. Cannot loosen.
3. Cannot corrode.
4. Cannot burn up or melt out.
5. Able to withstand surge currents.
6. Every strand is welded into the solid copper mass.
7. Easy to insulate because of small outer dimensions.
8. Requires no outside source of power.
9. Made with portable equipment—excellent for field use.

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for PRODUCTION efficiency of your POWER SUPPLY

When building or remodeling a plant, careful thought is given to plant layout so that the ultimate can be achieved in both efficiency and production. Production flow charts, showing the proper materials handling procedures and fabrication processes and their efficient power supply are all considered in blueprint planning.

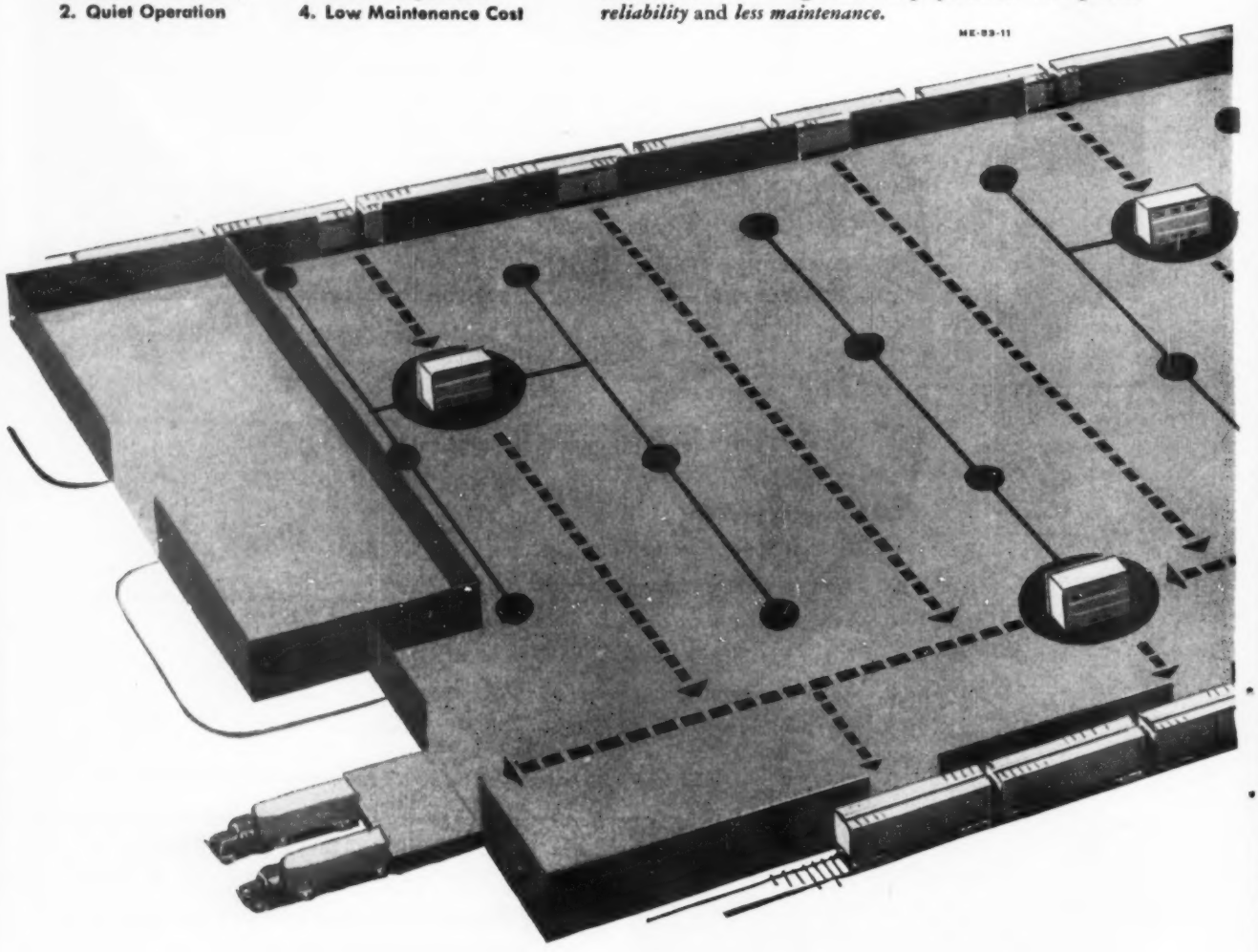
Such consideration would reveal the following features of prime importance for power supply

1. Location Flexibility
2. Quiet Operation
3. Efficient Operation
4. Low Maintenance Cost

Moloney Dry-Type Transformers will provide these features assuring you of an uninterrupted power flow under all operating conditions. Moloney Transformers also help to maintain higher levels of production efficiency for workers because of their quiet operation.

It would be wise to consider all these facts when selecting the Dry-Type Transformer to supply your power needs. If you do this, your choice will probably be Moloney . . . the transformer that gives *better performance* with *greater reliability* and *less maintenance.*

ME-53-11



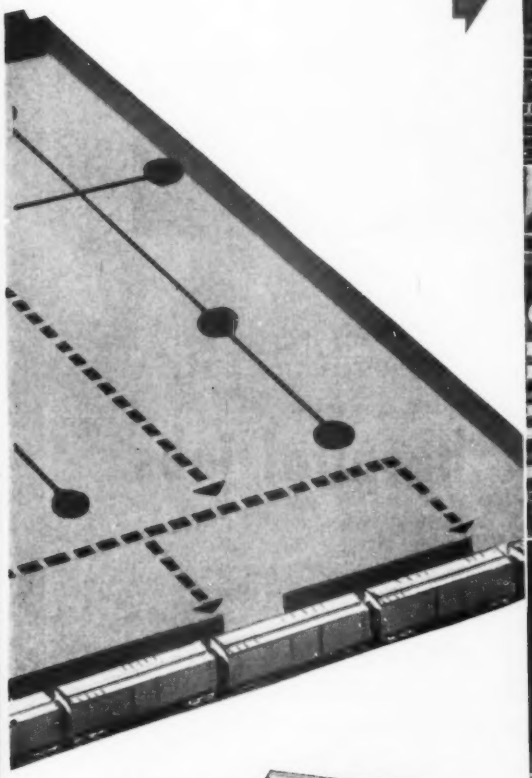
M O L O N E Y E L E C T R I C

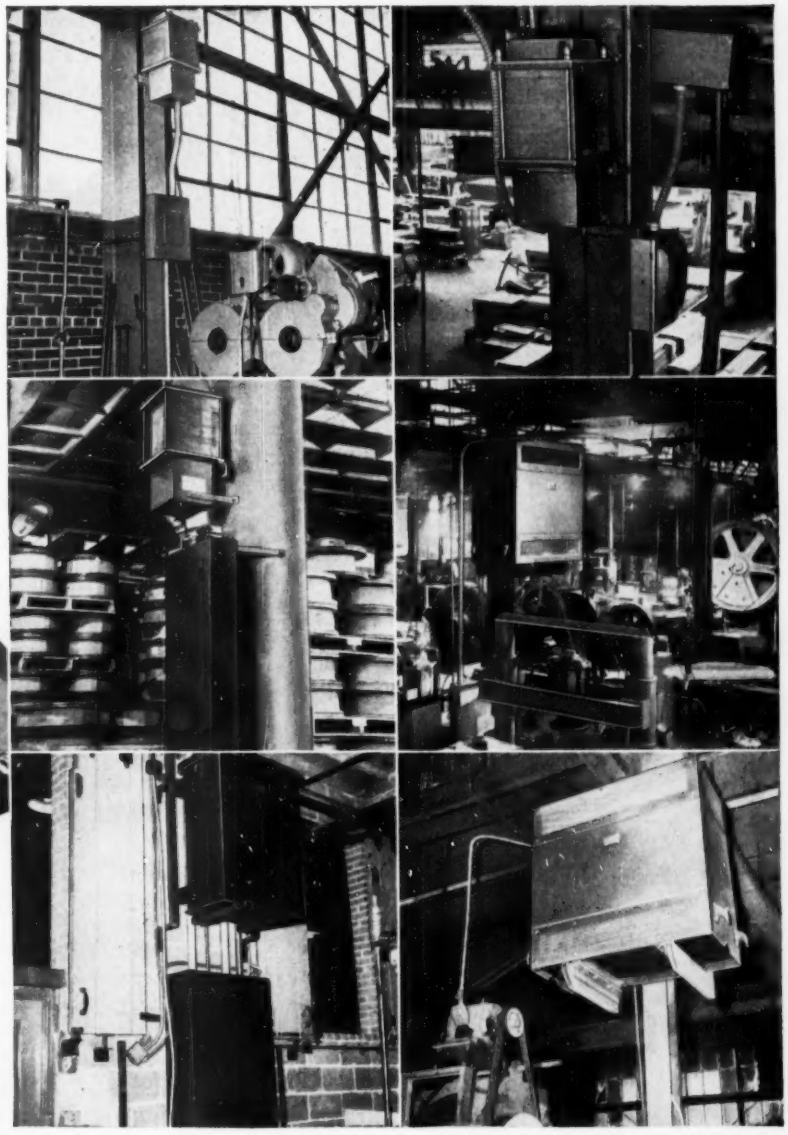
Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers

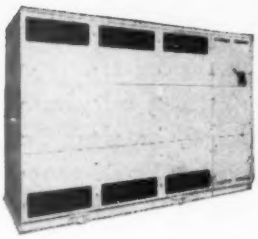
SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS

EFFICIENCY check the ... Specify MOLONEY!

Typical installations showing how Moloney Dry-Type Transformers are readily located at the most convenient point along the production line.







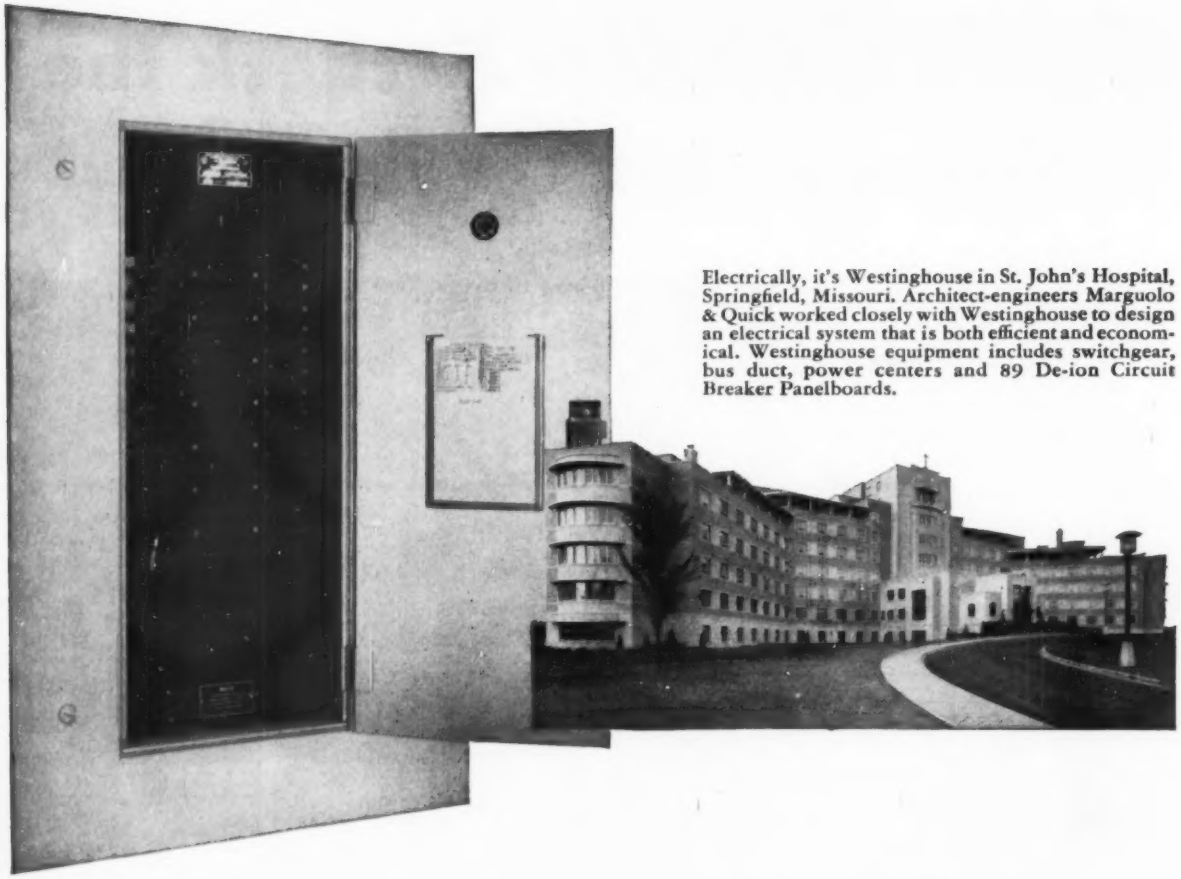
Moloney Dry-Type, Air-Cooled Transformer. Primary voltages range up to 15,000 volts, and sizes to approximately 3,750 Kva. Class B insulation (80° C. rise) is used.

C O M P A N Y

Step Voltage Regulators • Unit Substations

MISSOURI AND TORONTO, ONT., CANADA

MOLONEY ELECTRIC = { BETTER PERFORMANCE / GREATER RELIABILITY / LESS MAINTENANCE



Electrically, it's Westinghouse in St. John's Hospital, Springfield, Missouri. Architect-engineers Marguolo & Quick worked closely with Westinghouse to design an electrical system that is both efficient and economical. Westinghouse equipment includes switchgear, bus duct, power centers and 89 De-ion Circuit Breaker Panelboards.

Don't take chances with your hospital jobs

Install Westinghouse Panelboards for maximum protection . . . lower job costs

In hospitals, an element of safety depends on the circuit protection provided by panelboards. That's why contractors are turning to Westinghouse De-ion® Circuit Breaker Panelboards for hospitals and other jobs where long-lasting dependability is all important. Westinghouse Panelboards not only incorporate circuit breakers using the well-known de-ion principle, but other features of construction which provide life-long, trouble-free service.

There's a Westinghouse Panelboard for any circuit protection problem . . . in any type of building. Thirteen assembly plants give fast service and quick delivery throughout the country.

For the full story, call your Westinghouse Representative, or write for B-5260-A, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania. J-93499-A

YOU CAN BE SURE... IF IT'S Westinghouse

Three quality tapes—friction, rubber and plastic...

If the job requires taping -it calls for ACCURATE

Make ACCURATE Electrical Tapes your choice for easier taping and positive electrical and mechanical protection. Both friction and rubber, ACCURATE tapes are strong, pliable, easier working. These quality electrical tapes are non-raveling, tear off clean, pull tight and firm ... make neat, high efficiency wraps even over irregular surfaces.

For special jobs where a reduction in bulk is essential, specify ACCURATE plastic electrical tape. Thin caliper, combined with excellent dielectric strength, make it the ideal tape for faster wiring production!

ACCURATE FRICTION TAPE
High grade carefully compounded rubber with finest cotton base provides maximum mechanical protection for every wrap. Made in Standard and A.S.T.M.

ACCURATE RUBBER TAPE
Features high elasticity, excellent cohesion, high dielectric and super aging qualities. Available in Standard and A.S.T.M.-A.A.R. grades.

ACCURATE PLASTIC TAPE
Offers a bulk-reducing combination of thin caliper, good mechanical and dielectric strength. Recommended for use wherever plastic tape is practical.

NEW TAPE CATALOG AVAILABLE NOW!
Just call or write for the handy new Accurate catalog. A handy brochure for electricians, maintenance engineers and purchasing agents which includes all the facts on electrical tapes. Address: Accurate Mfg. Company, Garfield, New Jersey.

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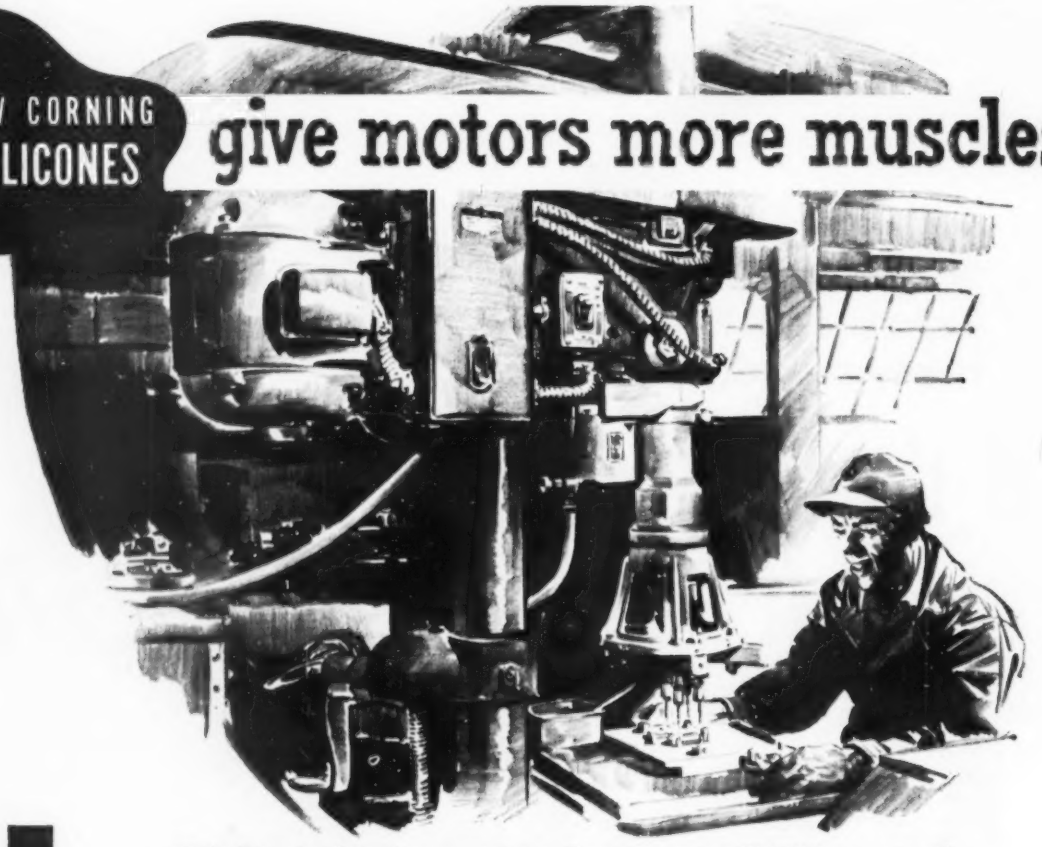
YOUR BEST BUY IN TAPE

MORE THAN A QUARTER CENTURY OF TAPE SPECIALIZATION

DOW CORNING SILICONES

give motors more muscles



Triple production; cut tool cost over $200 a month

OPTIMUM cutting speed of the 6-32 taps in the 4-spindle drill press operated by the Allen-Stevens Corp., contract die casters of Jamaica, L. I., New York City, is in the range of 1800 rpm. In an automatic feed machine, that spindle speed means about 1450 cycles, or 2900 full reverses per hour.

That many reverses overheated the 1 hp Class A insulated drive motor so badly that it had to be shut down a total of 2 hours out of every 8. To keep the machine operating 8 hours a day, spindle speed had to be reduced to 655 rpm—resulting in tap breakage averaging $10 a day.

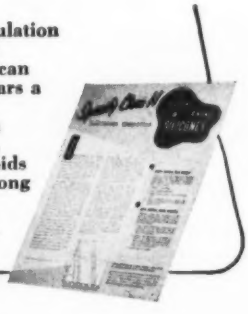
Allen-Stevens got themselves out of the dilemma by rewinding the motor with Class H insulation made with Dow Corning silicones. Spindle speed was immediately returned to optimum, and tap breakage stopped. Production has since tripled. Lost time has been eliminated entirely.

That's the kind of performance that has persuaded alert production, maintenance and top management men to specify Silicone (Class H) Insulation for hard working motors. Used to uprate motors by as much as 50%, it gives you more power at no additional expense for fittings, mounts or wiring. Cost is very little more than rewinding with the next best class of insulation.

free booklet

. . . tells how Class H insulation made with Dow Corning Silicones is saving American industry millions of dollars a year. See how Silicone (Class H) Insulation can be used to make motors, transformers and solenoids last 10 to 100 times as long as they ever did before.

Write for your free copy.



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Please send me:

- ☐ Performance data on Class H equipment
- ☐ List of Class H Rewind Shops
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- ☐ Data on Silicone Grease for motor bearings

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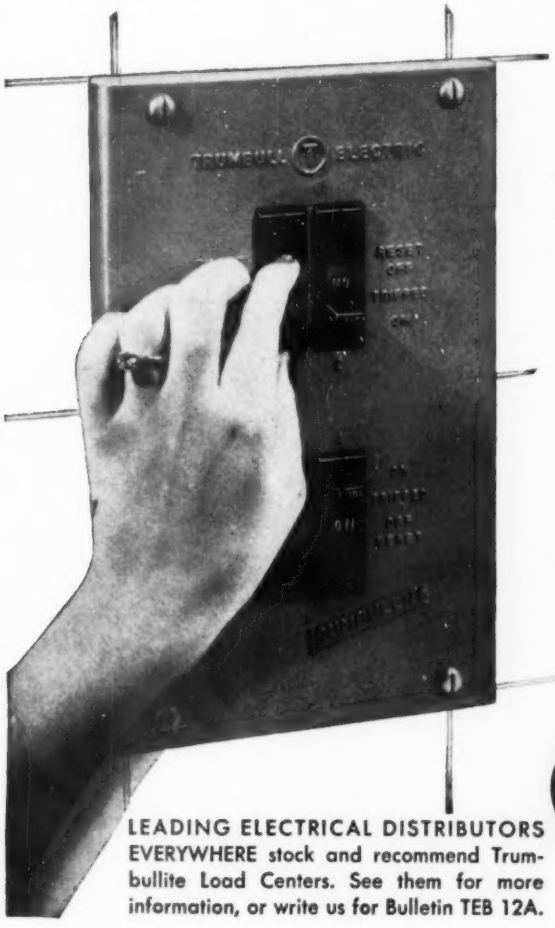
Here's the only evidence of superior wiring your customers can SEE and USE

Trumbullite

CIRCUIT BREAKER LOAD CENTERS

A home equipped with Trumbullite *looks* like more house, more electrical installation for the money, and that's exactly what it is – quality circuit breaker convenience and protection right at the housewife's finger tips.

Why pass up this added feature? You can buy Trumbullite at low load center prices. Installation is fast and easy with plenty of knockouts, free floating interior (except 40 amp. main size) for quick alignment, solid groundable neutral with solderless connectors, and clearly marked circuit numbers.



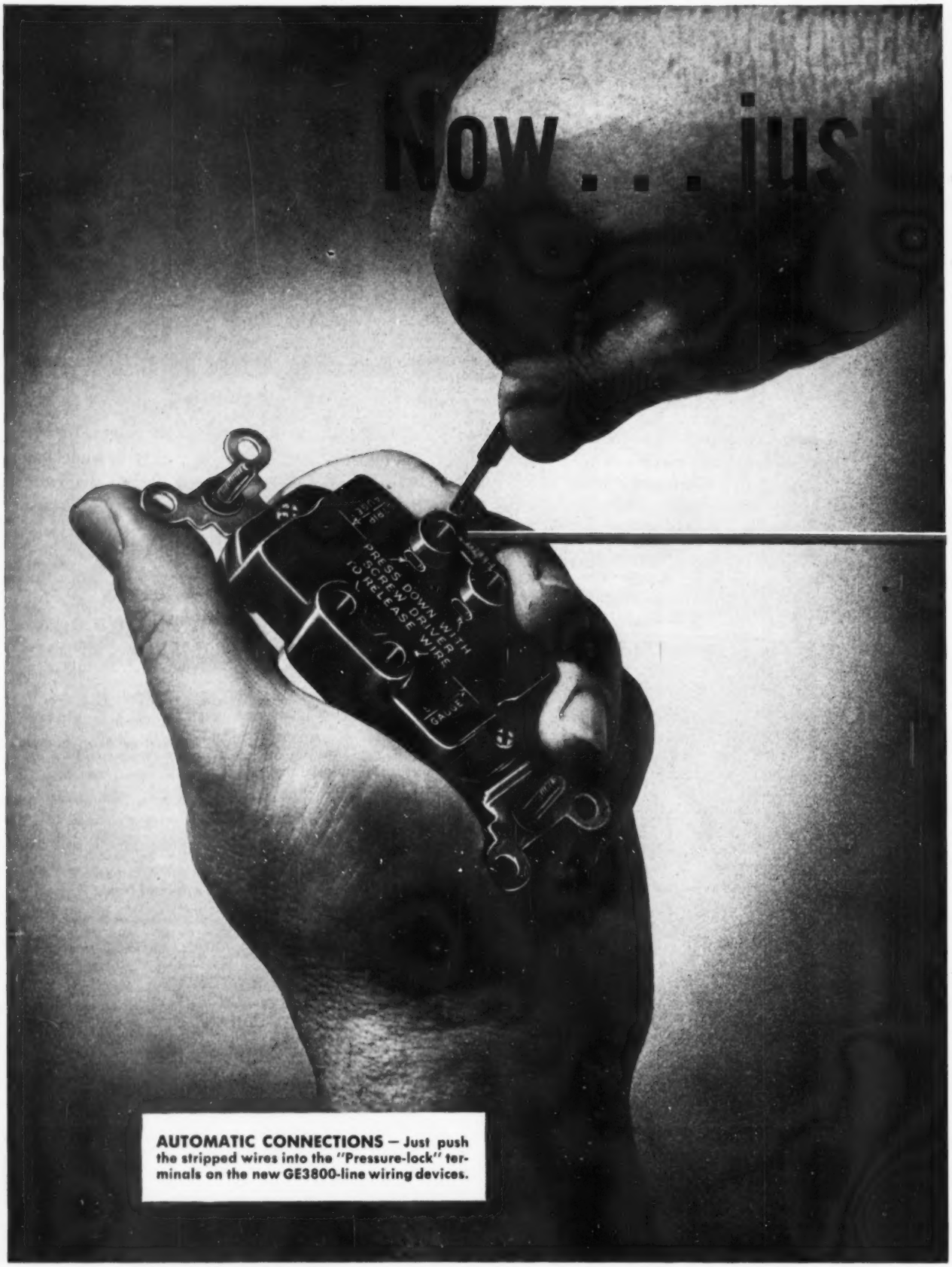
Quick Facts

- 2 to 20 circuits, 40-100 ampere mains.
- 10, 15, 20, 30, 40 and 50 amp., 120-volt breakers available.
- Famous TQL plug-in circuit breakers.
- Two-pole operation of adjacent breakers, through extension handles.
- Disconnecting means and overload protection for each circuit in one device.
- Primarily for residential and commercial applications.
- No external disconnect needed with 6 circuits or less.
- Covers clearly show ON, OFF, TRIPPED and RESET positions.
- Flush, surface or raintight enclosures.
- Underwriters' Laboratories listed.

LEADING ELECTRICAL DISTRIBUTORS EVERYWHERE stock and recommend Trumbullite Load Centers. See them for more information, or write us for Bulletin TEB 12A.

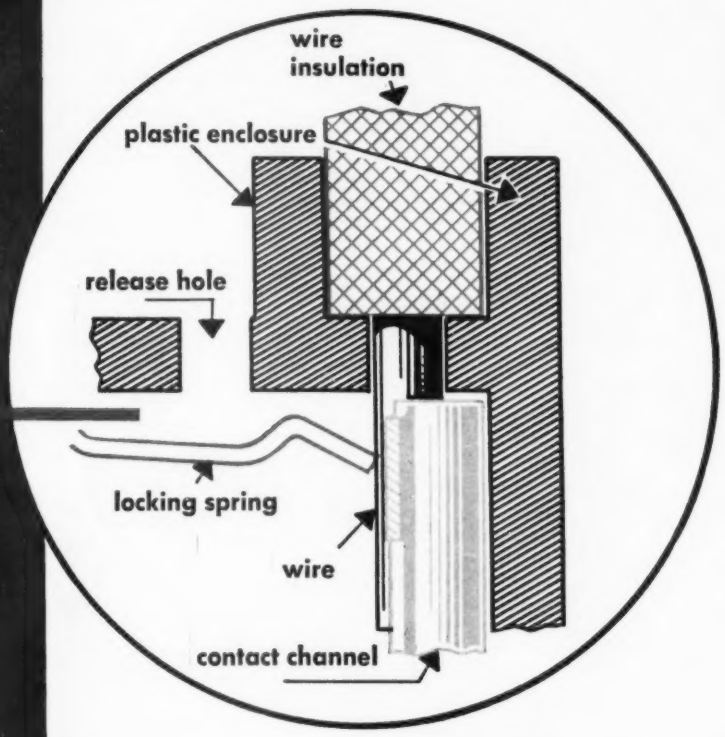
TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.



AUTOMATIC CONNECTIONS — Just push the stripped wires into the "Pressure-lock" terminals on the new GE3800-line wiring devices.

push in the wires



New G-E "PRESSURE-LOCK" Terminals

connect wiring devices automatically— without binding screws

YOU CAN NOW make electrical connections by simply pushing straight, stripped wires into terminal holes. That's all you do—a hidden spring-lock automatically grips the wire and holds it securely against a contact channel. These "pressure-lock" terminals are featured in the new GE3800-line of wiring devices—outlets, switches, and lampholders. They will take any No. 14, 12, or 10 Awg solid conductor, or No. 14 or 12 stranded wire with equal ease. They are listed by Underwriters' Laboratories, Inc.

EASIER—No binding screws to loosen or tighten . . . no looping of wires . . . no hooking around terminals . . . no crimping. Wires can be released instantly by depressing the locking spring with a screwdriver.

SURER—Wires are securely locked in place. A pull of 75 pounds won't loosen them. Neither will jarring or vibration. Constant pressure gives a positive contact against the channel.

SAFER—All live parts are completely enclosed to guard against shocks and shorts. There's no danger of loose connections.

For a copy of our folder on this revolutionary wiring method, write Section D89A-818, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

You can put your confidence in—

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DANGER SPOTS. Storms, floods, fires, collisions and accidents—beyond the control of ever-vigilant utility companies—can interrupt normal current supply. Darkness can be a serious menace to life and property.

Profits all around you

WITH

Exide LIGHTGUARD

There are hundreds of prospects for the moderately-priced Exide Lightguard—right in your own back yard.

Think what this means! You can sell Exide Lightguard to factories, schools, hospitals . . . theatres, restaurants, hotels, office buildings . . . stores and markets, banks, police stations —and for many other applications. Some industrial plants need as many as 200 Exide Lightguard units! And remember, emergency lighting is now required by law in many Cities and States. It is also a vital factor in civil defense programs.

Exide Lightguard is self-contained . . . portable . . . easy to install. When normal power supply fails, the Lightguard turns on *automatically* and *instantaneously* . . . flooding vital areas with protective light. Your prospects realize the critical need for emergency lighting —they *want* the protection of Exide Lightguard. They know that sudden darkness—caused by accidental power failure—can result in personal injury, property damage, pilferage.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"EXIDE" and "LIGHTGUARD" *Reg. T.M. U.S. Pat. Off.*

1888...DEPENDABLE BATTERIES FOR 65 YEARS...1953

TAKE THE FIRST STEP TOWARD BIGGER PROFITS!

Act fast. Get there first with Exide Lightguard. For complete details fill out and mail the coupon today.

EXIDE LIGHTGUARD

A portable, low cost unit that can be plugged into any A.C. lighting outlet. When normal supply of current fails, a built-in relay instantly and automatically turns on the powerful floodlights. After normal service is restored, the relay shuts off floodlights and returns battery to charge. The Exide battery is always ready for immediate action.

ATTENTION, CONSULTING ENGINEERS

To meet specific requirements of fixed installations, Exide emergency light and power equipment is available to meet a wide range of conditions. Exide engineers will be glad to help with your problems.

SEND THIS COUPON NOW!

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2, Pa.

Sure . . . I want to cash in on the Exide Lightguard. Rush details.

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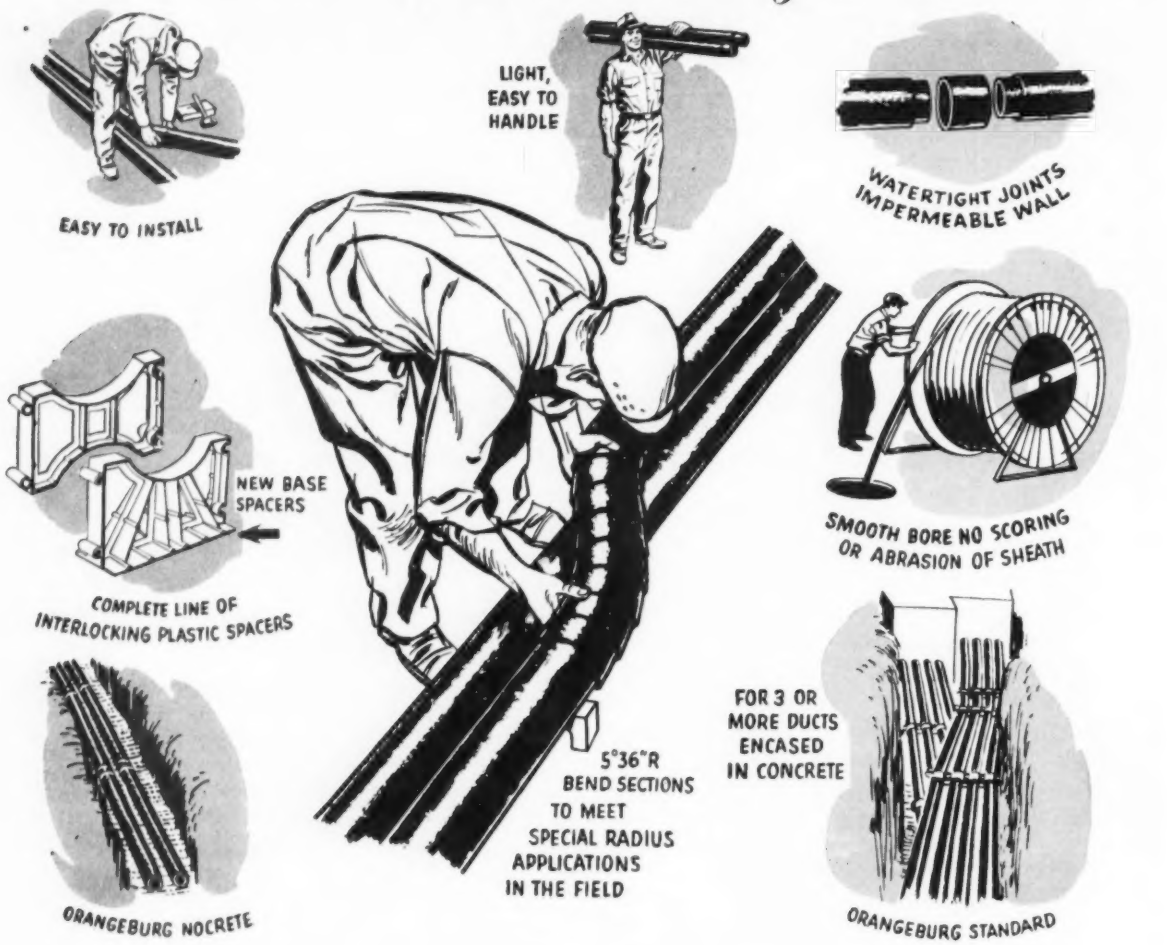
CITY ..... STATE .....

My present business is: ☐ Electrical Contractor ☐ Consulting Engineer ☐ Architect ☐ Distributor ☐ Dealer ☐ Other .....

1893 — 60th Anniversary — 1953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LIGHT, EASY TO HANDLE
WATERTIGHT JOINTS IMPERMEABLE WALL
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COMPLETE LINE OF INTERLOCKING PLASTIC SPACERS
SMOOTH BORE NO SCORING OR ABRASION OF SHEATH
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BRANCHES AND STOCKS IN PRINCIPAL CITIES

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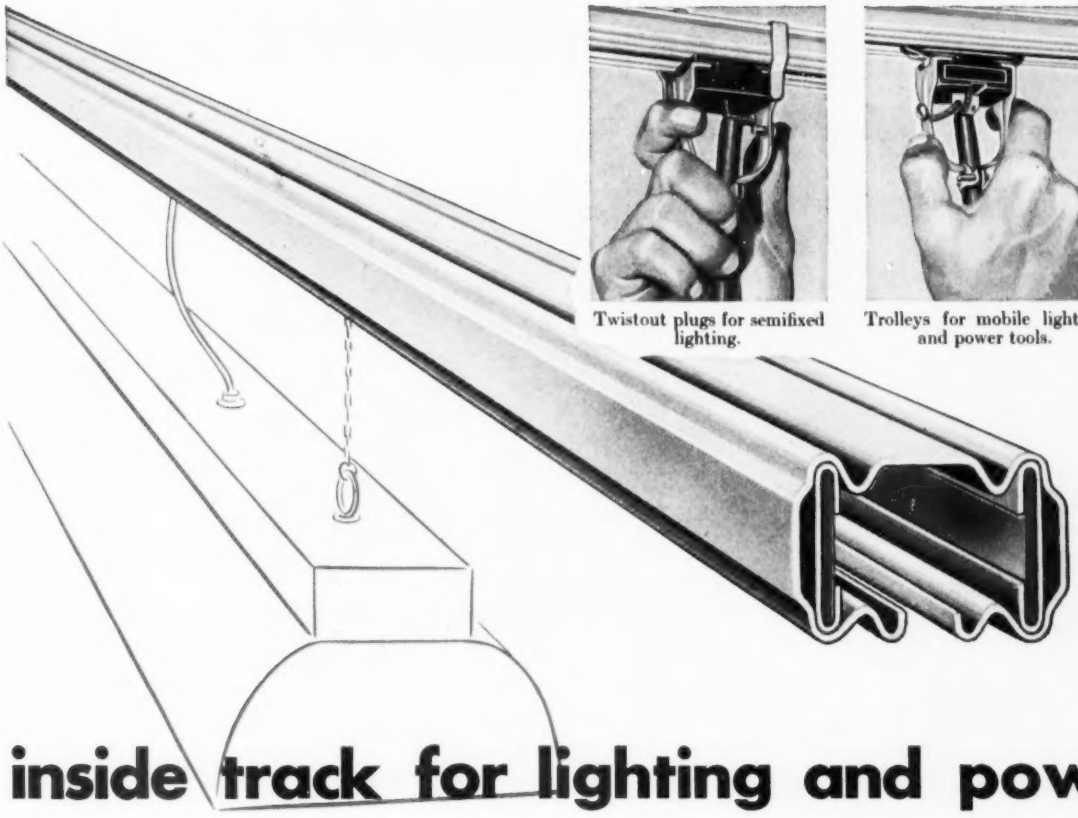
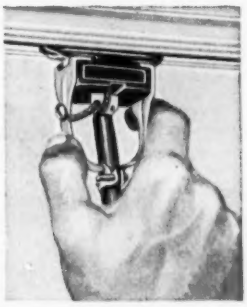
A DIVISION OF GENERAL ELECTRIC DISTRIBUTING CORPORATION

BullDog Universal *Trol-E-Duct*



Twistout plugs for semifixed lighting.



Trolleys for mobile lighting and power tools.

inside track for lighting and power

To feed one light, or a thousand . . . or for electrified track for mobile tools and lights . . . install BullDog Universal Trol-E-Duct. You'll get flexible power—supplied at low cost—from this small-sized, continuous outlet duct system.

Standard 5′ and 10′ duct sections, twistout plugs, trolleys and hanger accessories make up this completely prefabricated, completely reusable system. Installation is simple, fast. Once installed, it provides complete flexibility, permitting additions or rearrangements as conditions require.

For planning help or additional information, consult your nearest BullDog Field Engineer, or write BullDog Electric Products Company, Dept. EC83, Detroit 32, Michigan.

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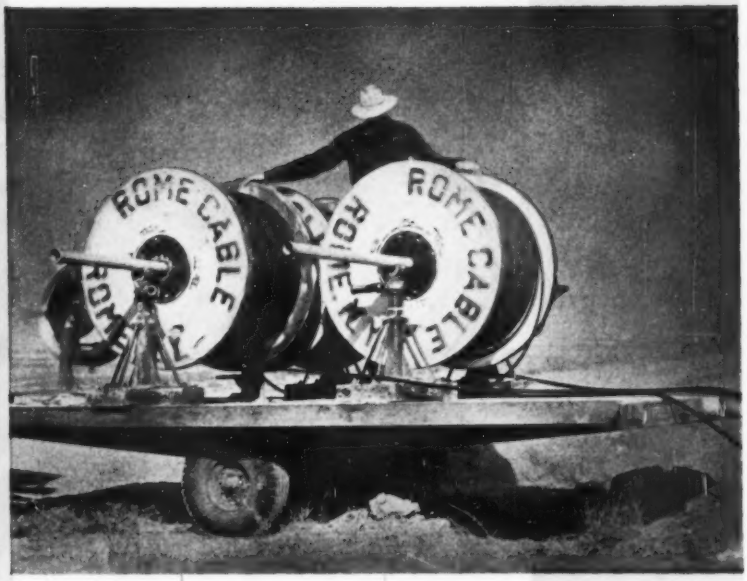
THOROUGHBRED IN ELECTRICAL EQUIPMENT

BULLDOG
ELECTRIC PRODUCTS COMPANY

They couldn't afford less

Trench digger breaks ground for laying of 5 KV RoZone-RoPrene power cables to supply runway lights.



RoZone-RoPrene power cable being reeled off and laid in trench.

All-resistant RoPrene sheath and moisture-resistant RoZone insulation permit direct earth burial. Note "counterpoise" wire for lightning protection.

In this installation cables were covered with three inches of sand to prevent mechanical damage from rocks, etc.

than the best cable

at Salt Lake City

Whether you are selling or installing airport wiring, bear in mind that the buyer has two prerequisites (1) dependability, (2) long-time economy.

The Salt Lake City Municipal Airport is a case in point. Here, 5 KV RoZone-RoPrene (CAA-L-824, Type B) airport lighting cable was specified for several reasons.

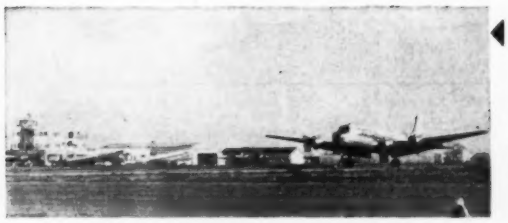
Its premium quality oil base insulation (RoZone) assures exceptional protection against operating temperatures and moisture. High impulse strength aids against lightning damage.

At the same time, its Neoprene (RoPrene) sheath resists the attack of soil acids, oils, greases, alkalies, moisture and flame. These features, plus inherent toughness, permit direct burial in earth.

The contractor also realizes considerable cost savings because of easy installation. Both RoZone-RoPrene and RoMarine (specially compounded rubber insulation)-Ro-Prene (CAA Type A) eliminate costly man hours.

They are especially easy to tap and splice. Simple manual connections eliminate potheads and stress cones.

But, regardless of whether you are selling or installing cable in airports, industrial plants, buildings, homes or farms, your reputation insists that you take *no less than the best.* Standardize on Rome wires and cables. Mail the coupon for your free copy of the Rome Power and Control Cable Catalog.



Installation: Salt Lake City Municipal Airport.

Electrical Contractor: Thompson Electric, Salt Lake City.

RoZone-RoPrene was the first cable construction to be approved as Type B under CAA Specification L-824.

RoMarine-RoPrene was the first cable construction to be approved as Type A under CAA Specification L-824.

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Corporation
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and
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ROME CABLE CORP., Dept. EC-8, Rome, N. Y.

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Company.....

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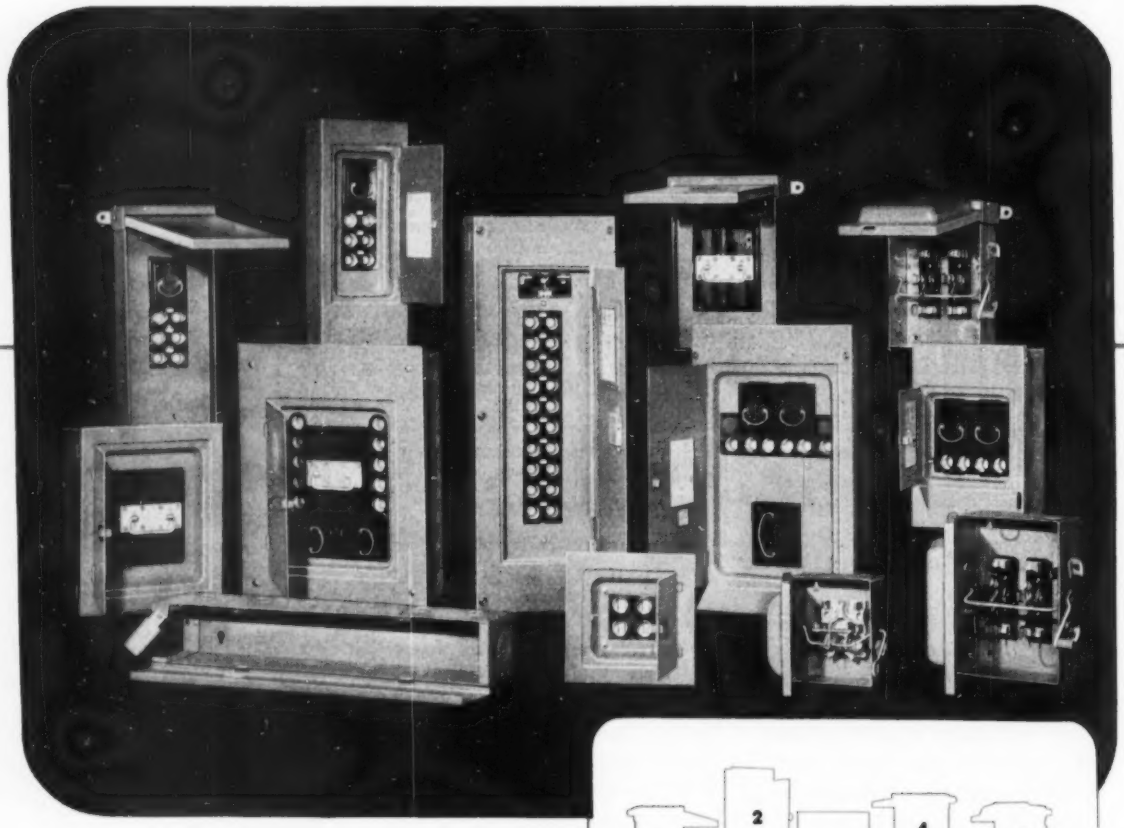
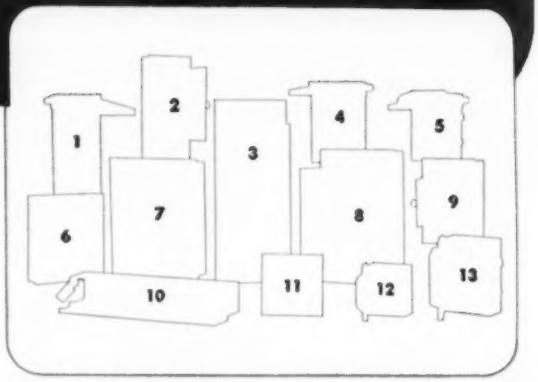
Quit shopping! There's a Federal Noark® fusible device for every job





YOU'LL SAVE YOURSELF time, trouble and dollars by standardizing on *one* really modern line of fusible devices... and you'll do it best by adopting Federal Noark's complete line of service entrance equipment!

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FEDERAL NOARK®

Washington Report

A mid-year business survey by Commerce Dept. revealed continued growth, but indicated the boom is lagging in some sections. Production in 2nd quarter increased in both dollar and physical volume over first quarter. All signposts point to a continued high plateau for balance of 1953, but few observers believe the boom can last much longer.

Props supporting present boom include: personal income hit a new high in 2nd quarter (May record was at rate of $284-billion annually, up 17% from 1952); major consumer durable goods output first half of year was 40% above 1952 like period; purchasing power of dollar has increased; consumer demands are about 7% higher than last year; government spending for national security increased in 2nd quarter to rate of about $53-billion annually; and construction activity first half of year was ahead of last year about 8%. Steel demand into 4th quarter indicates record production for year.

Most economists believe that any recession will be mild. The decline would be gradual, they say, and level off at a lower plateau.

Congress extended NPA for one month, from June 30 when it was scheduled to fold to the end of July, and provided it with $375,000 to continue defense controls. This gave the lawmakers time to consider a separate appropriation to extend NPA for another eleven months.

Department of Commerce plans were to replace NPA by a proposed Business Services Agency, which would inherit NPA's remaining defense production and materials controls, and otherwise provide a variety of information services for businessmen dealing with other government bureaus. Congressional members think BSA and defense controls should remain separate.

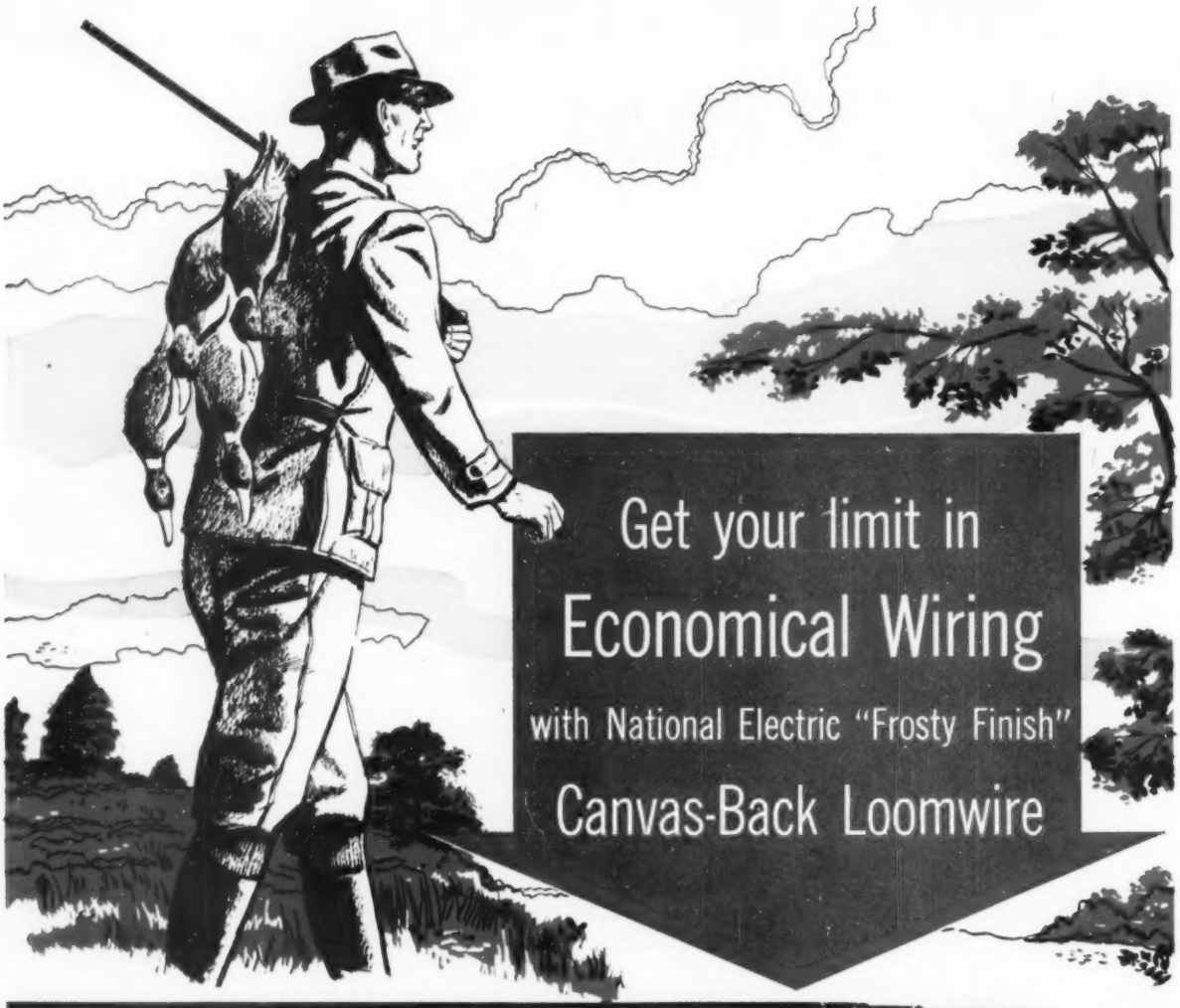
A new lending agency proposed by Congress and wanted by Eisenhower would replace the Reconstruction Finance Corp. and Small Defense Plant Administration. It would be known as Small Business Administration, carry out many functions of the two older agencies. Differences between separate House and Senate bills were being ironed out late in July.

Government competition with private industry will be investigated by a new Government commission expected to be set up soon to streamline the Executive Branch. Former President Herbert Hoover has been appointed to head up this commission and investigation.

U. S. exports for first five months of 1953 dropped $162-million from similar 1952 period, to $6.7-billion total. Military items were valued at more than double the 1952 total. Imports were up $150-million over 1952, to a $4.7-billion total.

Conservation techniques in the building industry are covered in a 179-page report by the Building Research Advisory Board, ODM has announced. This report shows progress made last year on over 200 recommendations for conservation measures in structural design, heating, plumbing, air conditioning and electrical systems.

New construction activity is at record level, some 8% ahead of year ago, but housing starts have declined two months in succession. Union wage scales in seven construction trades rose 2.6% during second quarter for an approximate total increase of more than 30% over the 1947-1949 level (see page 179).



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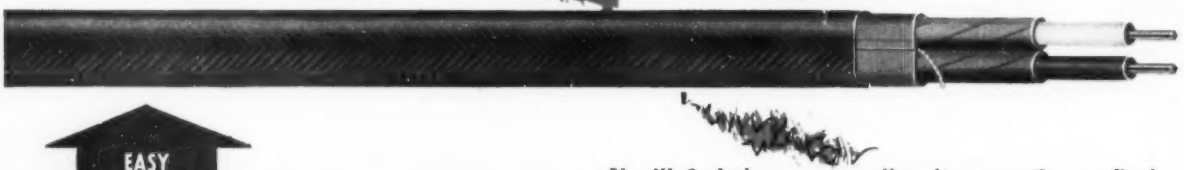

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AUGUST . . . . at a Glance

Truce

After those long months of alternating hope and despair for a clean break in the Korean fighting the actual signing of a truce agreement came quietly on a Sunday night. Is it a prelude to peace in the world? This we shall not know for months or perhaps years yet.

The cease-fire took us back to those gloomy days of 1950 when the shock of Communist aggression broke on the world. What was it going to mean to the electrical business? Washington agencies were contacted for clues to probable courses of action. A conference was hastily arranged with a top electrical industry leader on the speculation, which proved correct, that he was to assume an historic role in mobilization. The proceeds appeared in a two page editorial in August 1950 *Electrical Construction & Maintenance* under the title "The Road Ahead."

Most of the predictions of that editorial have come to pass. We can only hope that some are now history. But its first sentence still stands; "We shall be living and working in a military economy into the indefinite future."

For the business outlook, a Korean cease-fire has been discounted so often that the actual event is likely to effect few important changes. Our mobilization planning to create areas of strength continues. The reconstruction of South Korea has been long predicted as an inevitable economic burden which will be offset by the ending of the cost of battle. Our commitments to our allies are not reduced nor are the pressure points of the enemy any less threatening over the world.

Thirty Acre Plant

Our "Outstanding Electrical Construction" feature this month is the electrical systems for the Cleveland Chevrolet plant. Served by five substations operating from 11 kv primary distribution the system serves a wide variety of electrical energy applications.

The system was installed by electrical contractors Hatfield Electric and Fischback & Moore. It encompasses overhead and underfloor busduct, super-cycle tool operations, split bus for welding loads and ingenious application of power control centers.

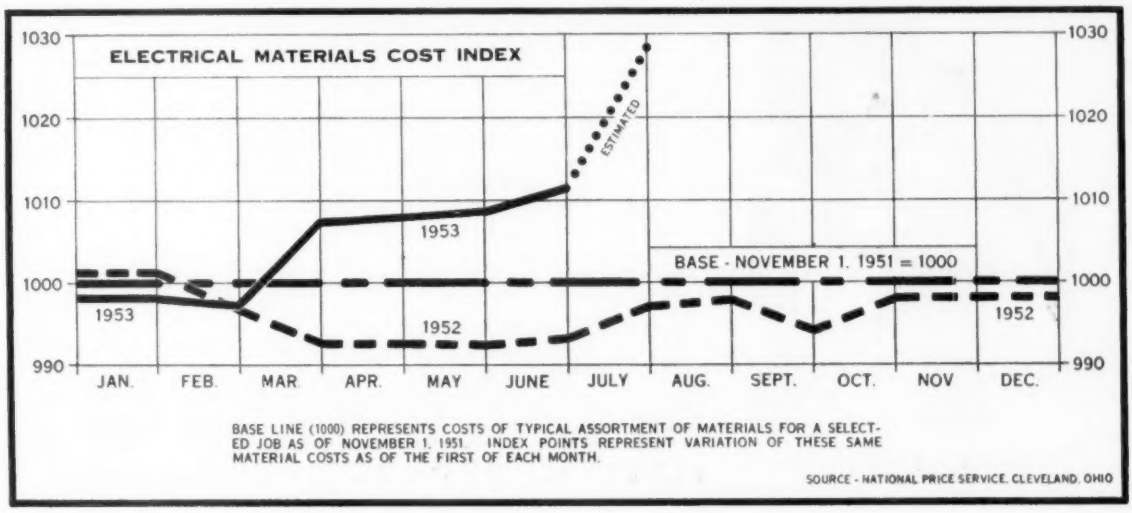
Promotion

In the ultra conservative electrical contracting business effective sales promotion is usually a pioneer venture over uncharted seas. Hugh Scott's report on the unusually well developed operations of the California Electric Works in San Diego is rare fare and offers some excellent guide lines for those who would like some practical ideas on how to put the powerful instruments of sales promotions to work on their own market opportunities. This progressive organization has a wide-awake business promotion campaign that ranges from steak dinners and clever mailing pieces to radio shows and educational demonstrations before civic groups. See "Some Practical Ideas For Effective Business Promotion" beginning on page 74.

Multiple Conductors

The new '53 Code will virtually eliminate existing limitations on the use of conductors in multiple. The way is open for the development of circuits based upon multiple conductor feeder legs with many useful advantages in wiring designs and installations.

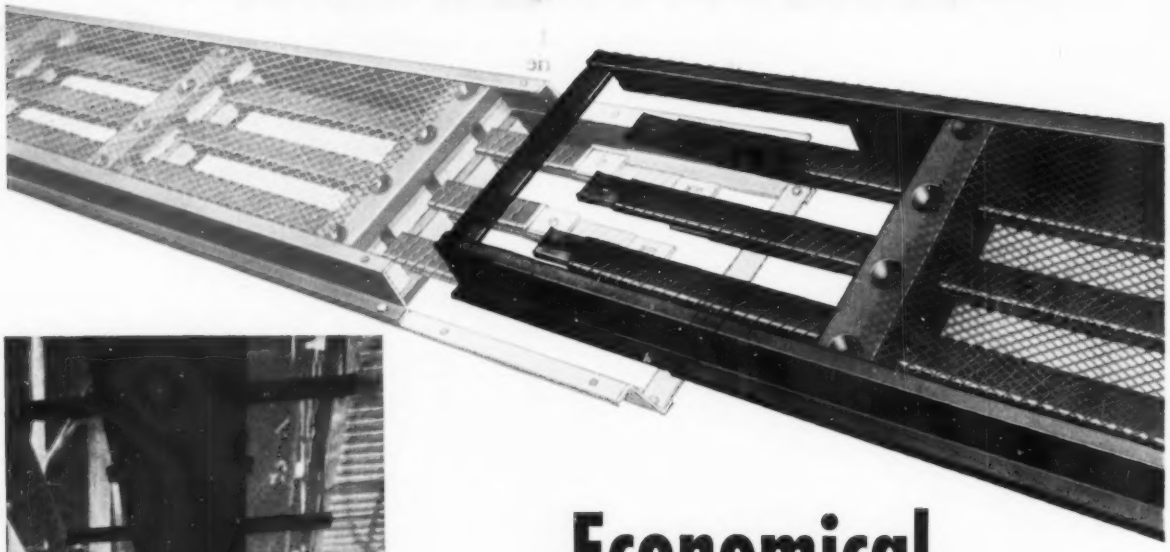
Carroll A. Badeau, chief engineer of Thomas and Betts has prepared a report for us demonstrating the applications of multiple conductor feeders under the new rules in "Conductors in Multiple," page 89.

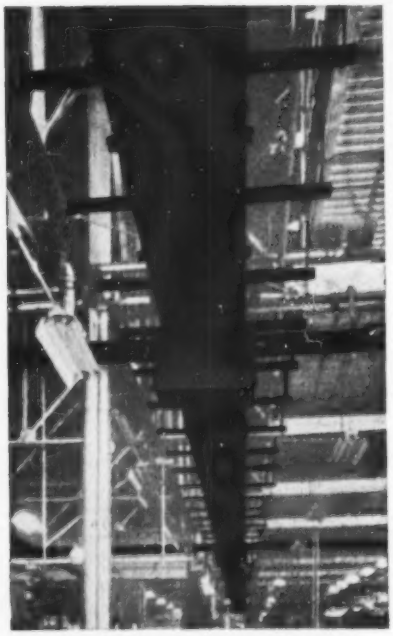


BASE LINE (1000) REPRESENTS COSTS OF TYPICAL ASSORTMENT OF MATERIALS FOR A SELECTED JOB AS OF NOVEMBER 1, 1951. INDEX POINTS REPRESENT VARIATION OF THESE SAME MATERIAL COSTS AS OF THE FIRST OF EACH MONTH.

SOURCE - NATIONAL PRICE SERVICE, CLEVELAND, OHIO

BULLDOG BUStribution® DUCT





Prefabricated 10' sections and standard fittings give Ventilated LO-X Duct complete flexibility. 800A. to 4000A. at 600 volts or less.

Economical
• to install
• to operate

For faster, easier, more economical installation of duct sections, BullDog LO-X BUStribution DUCT uses the scarf-lap joint—a thoroughbred engineering feature that pays off in extra savings for you.

With BullDog's exclusive scarf-lap joint (shown above), duct sections simply overlap and bolt together . . . making a stronger, more rigid assembly. Bulky, complicated joint fittings are eliminated. Savings in time and money are substantial.

Another great economy feature, BullDog's unique paired phasing arrangement, lowers reactance in the bus bars. It assures you the *lowest possible* current carrying cost per ampere per foot.

Get complete information on LO-X Duct (for feeder and welder circuits) and Plug-in Duct (for branch circuits). Consult your nearest BullDog Field Engineer —offices in principal cities throughout the United States and in Canada. Or write BullDog Electric Products Company, Dept. EC83, Detroit 32, Mich.

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THOROUGHBRED IN ELECTRICAL EQUIPMENT

BULLDOG
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ELECTRICAL CONSTRUCTION AND MAINTENANCE

52nd Year—AUGUST • 1953

Automation

AUTOMATION IS A NEW WORD heard frequently nowadays when people talk about industrial processes and machinery. It usually means a group of related industrial operations under automatic program control. As a theoretical concept it is a wondrous field, taxing the mental powers of mathemeticians and philosophers. But for electrical people it is significant because we find ourselves in the midst of an industrial revolution in which we are the custodians of much of the essential technology.

THE ROLE IS NOT NEW for the electrical engineer and contractor. It was he who broke the shackles of belts and shafting which bound the process rigidly to its source of power. It was he who moved the control of the process to the place most advantageous to the operator. It is he who applies and installs the automatic controls which are gradually eliminating routine manual operations. In each of its giant strides, industry has turned to him for the practical technology essential to progress.

SO WITH AUTOMATION the concepts may stagger the imagination, but the implements are mostly from stock. Industrial applications usually represent novel uses of otherwise conventional components installed under much the same order of engineering and craftsmanship that industrial electrical work has long required from this industry.

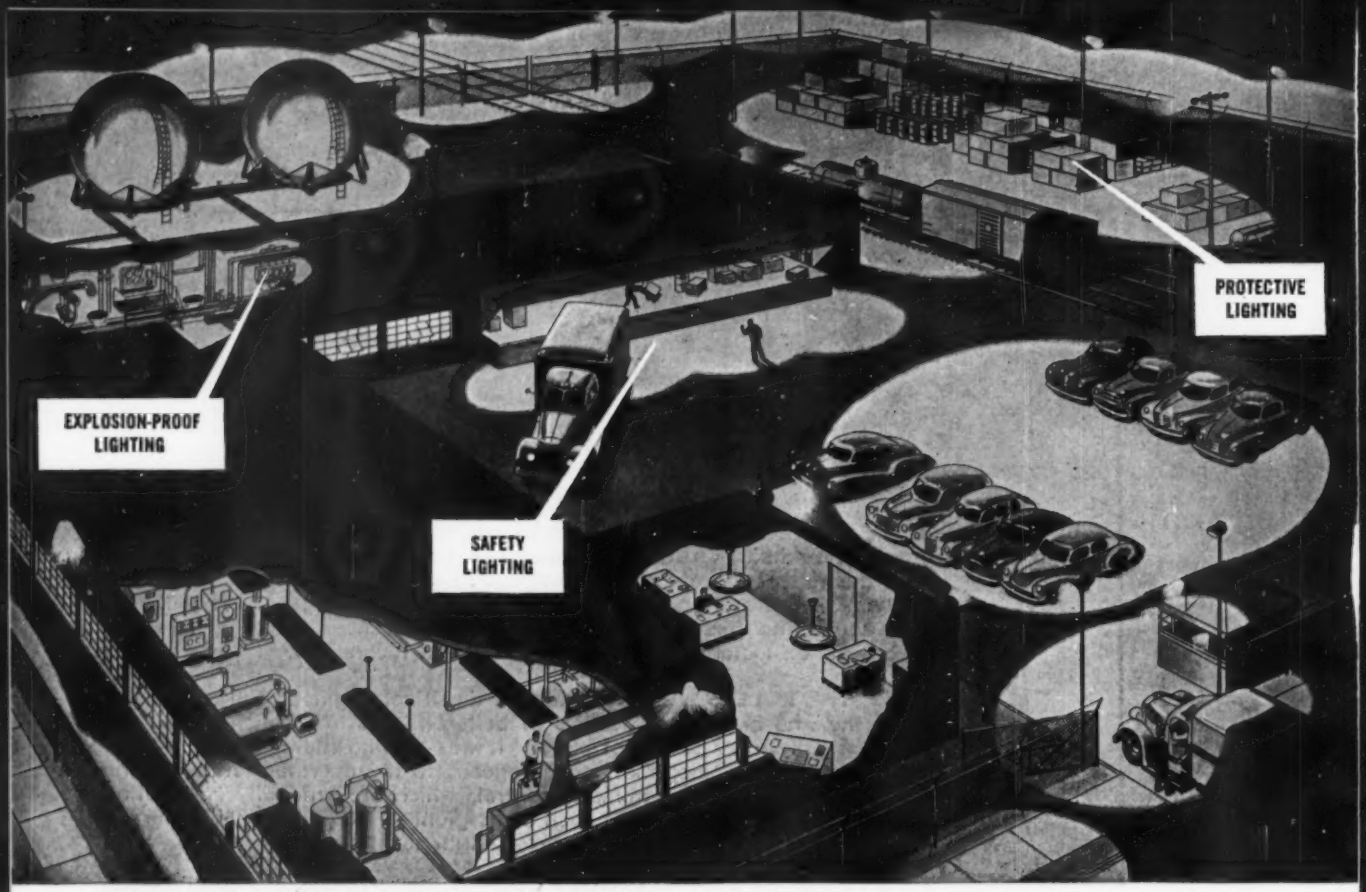
THE CURRENT TENDENCY to glamorize automation needs to be discouraged. Emphasis on the marvels of automatic factories operated by electronic brains scares off practical management people and presents a grossly distorted view of an essentially logical and useful development in industrial control. Applications of automation principles in industry are not necessarily spectacular or radical. More often they grow gradually out of conservative decisions made on the basis of sound engineering analysis.

THE KEY ROLE of the electrical industry in the progress of automation carries with it a considerable burden of responsibility. The principles must be interpreted in terms of practical components. The need for a sequence interlock, for instance, must eventually be expressed in the choice of a particular contactor or a particular limit switch. And the various elements and devices must be appropriately connected for the desired operation.

EQUALLY IMPORTANT, however, are the considerations that must be given, in choice of components and in circuitry, to the requirements of maintenance. The electrical links that bring machines under automatic program control, unfortunately, also hook up their troubles. And we may find that maintenance requirements will ultimately set the practical limits.

IN THE LONG RUN, automation is going to require more exacting standards of materials and workmanship and of maintenance procedures. It will also inspire some new and exotic gadgets. But the bulk of the job will be done with standard motors and control and with pipe and wire.

Wm. T. Stuart



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When the job's a tough one, call in your local Graybar Lighting Specialist. He's ready to help you and your customers develop tailor-made layouts for all types of protective or explosion-proof lighting installations.

But, no matter what the job—when it first comes up—*that's* the time to contact your Graybar Representative. Let *him* furnish the delivery, price, and specification data you need to make your bid. You'll get it fast, too, because Graybar people have this sort of information right at their fingertips. Later on, it's a simple matter to write out a single order for all the lamps, fixtures, wire, and fittings you need—saves you dollars both in time and paper work.

Remember, Graybar distributes over 100,000 different electrical items, including the most complete selection of lighting units and lamps available anywhere.

In fact, it pays to check with your local Graybar house for *everything electrical*—for wiring, power, ventilation, and communication, as well as lighting. 200-48

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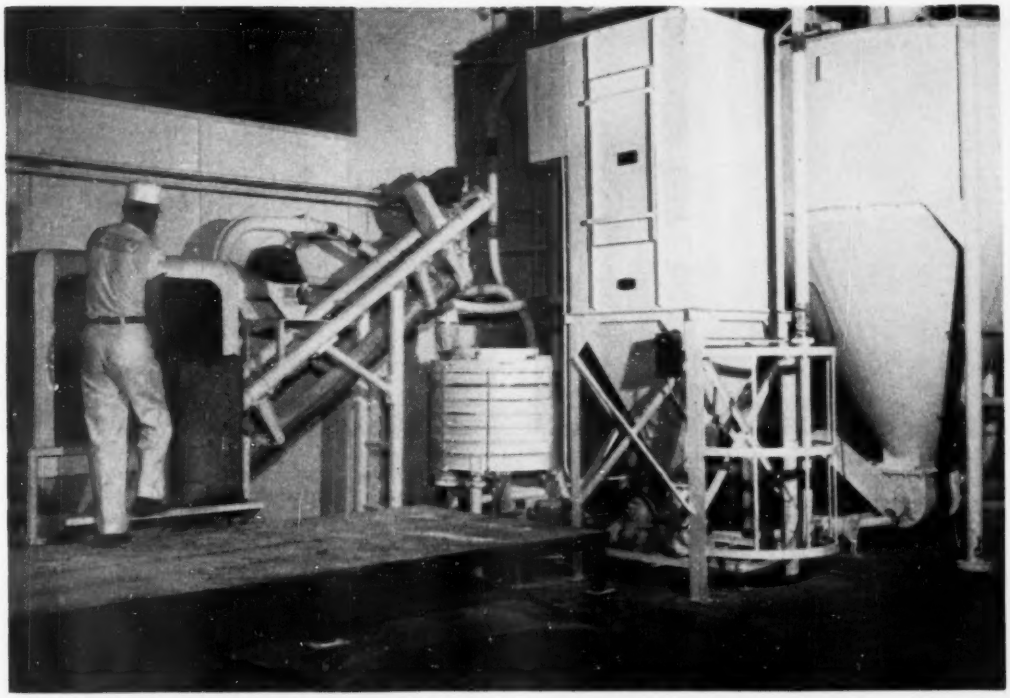


PNEUMATIC FLOUR HANDLING system is first step in bakery mechanization. Flour is pulled from sack unloader, through sifter, to top of three storage bins. Pneumatic tubes carry flour from any one of the three bins to any one of four dough mixers where it is weighed automatically on scale hoppers.

A Case Study of

Mechanized Bread Production

involving substantial electric power and pushbutton control at the Gardner Baking Company's new Madison, Wisconsin plant. Capital Electric Company collaborated in the electrical system design and made the complete installation.

By W. C. Schlosser

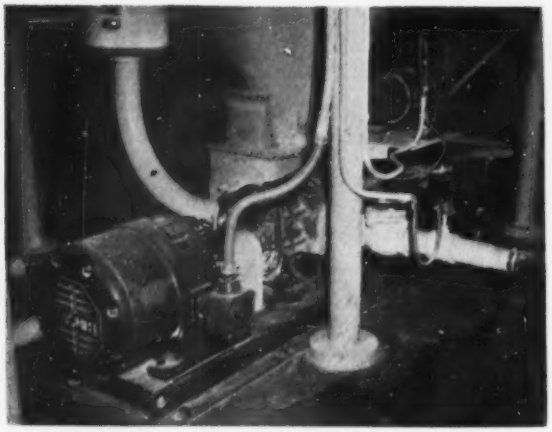
Capital Electric Company
Madison, Wisconsin

A MODERN bakery, like a modern manufacturing plant, depends heavily on mechanized processing and material handling equipment to increase production and product quality and simultaneously decrease unit costs. Electric power and finger-tip control of associated motorized units permits full utilization of these techniques.

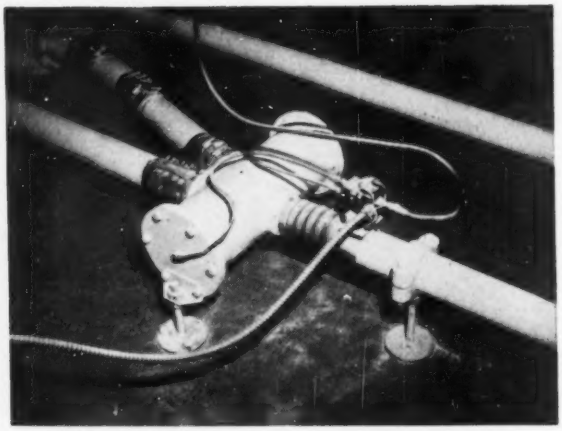
Typical of the present trend toward automatic bakery operation is the new 74,000 sq. ft., one-story plant of the Gardner Baking Company in Madison, Wisconsin. Here, mechanization has been introduced to the fullest extent—all along the line from flour sack to truck loading dock. And it takes some 800 kva of electrical energy to do the job.

Because the electrical system is the life-line of plant operation, considerable time and engineering talent were devoted to this phase of plant construction. Collaborating with Gardner management on the electrical design and layout were engineers of the C. J. Patterson Company, Kansas City, Mo., and the engineering staff of Capital Electric Company, Madison, project electrical contractor. Out of this meeting of minds came an electrical system tailored to specific plant operating requirements with ample spare capacity and facilities for future expansion.

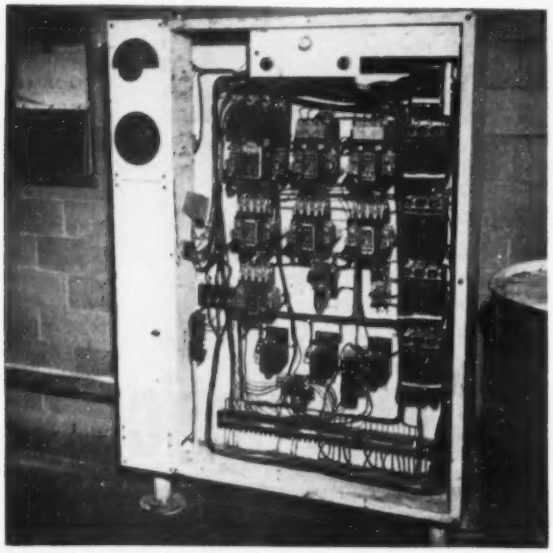
Dual primary service (4160/2400-volt Y) enters the building underground and feeds two air-cooled transformer unit substations. One, of 300-kva capacity, serves four mixers and four distribution panels. The other, of 500-kva capacity, serves the ovens and 11 distribution panels. Each substation has a 3-position fused primary load switch. Each primary feeder consists of three No. 1/0, 5,000-volt,



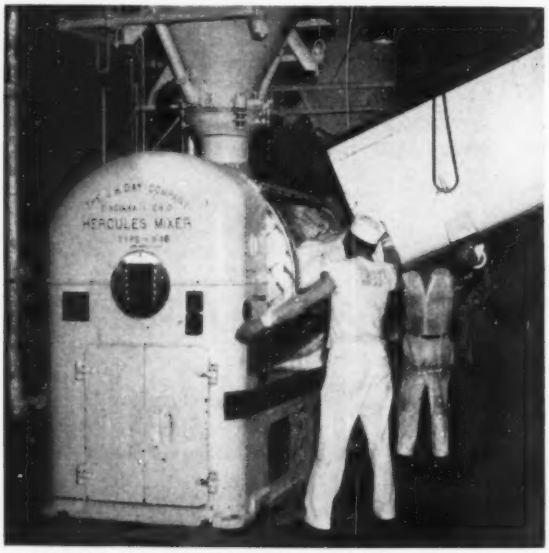
ONE OF SEVERAL 15 hp., 220-volt, 3-phase motors driving blowers which supply air to the pneumatic flour handling system. This one pulls air into tube system supplying mixers with flour.



SOLENOID ACTUATED air valve on flour tubes under storage bins. Solenoid mechanism controls air flow that shifts large pneumatic valve in proper position to draw flour from desired storage bin.



CENTRAL CONTROL PANEL in mixer room operates pneumatic flour handling system. Operator sets two knobs (upper left) to desired bin and mixer number to direct flour to scale hopper. Relays control blower motors and solenoid air valve.



OVERHEAD ELECTRIC HOIST lifts and tips dough troll to spill 1,600 pounds of "sponge" into mixer for second mix after coming out of fermentation room at right. 3-hp. hoist motor is fed by 100-ampere trolley duct.

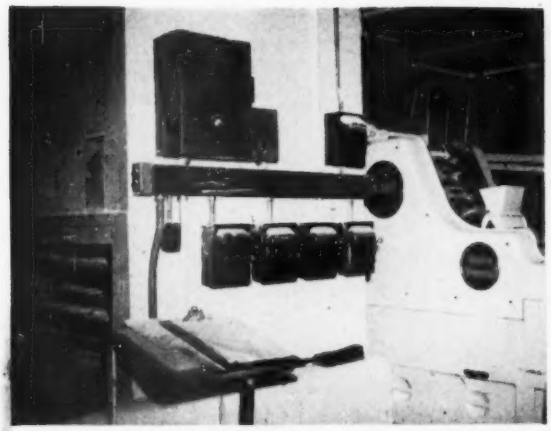
Neoprene insulated conductors and one No. 4 bare neutral in 4-inch ducts. Spare primary underground ducts terminate at a wall of the L-shaped building to serve a future 300 or 500-kva unit substation in the event of building expansion.

Secondary radial distribution at 120/208-volt, 3-phase, 4-wire, originates at air circuit breakers on the secondary side of the unit substations. A 4-inch underground empty conduit between secondary cubicles of the two substations provides duct facilities for emergency use. Panel feeders (up to 750MCM size) and practically all branch circuits (except lighting) are run in the floor slab to facilitate general plant housekeeping. Lighting accounts for an estimated 13.5% of the total connected load, with heaviest concentration being in the high-intensity fluorescent installation in the second-story office section at the front of the plant.

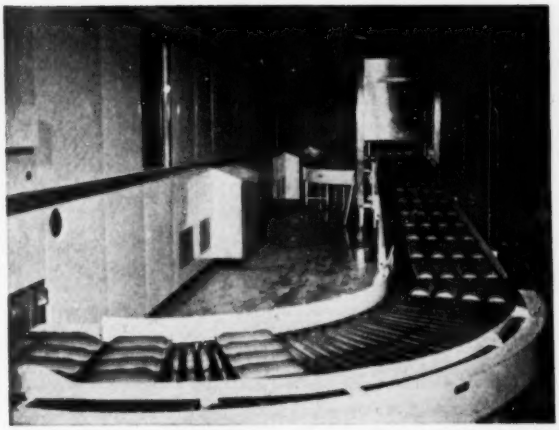
Voltage drop was an important factor affecting secondary distribution design. Conductor sizes were chosen on the basis of a 2% to 3% drop from substation to motor control unit in the case of power circuits and a 1% drop from substation to outlet for lighting circuits.

Largest motors in the bakery are three 40-hp and one 50-hp across-the-line-starting units on the mixers. Greatest number of motors, mostly fractionals to one hp, are involved in the extensive conveyor system extending from bake ovens to loading dock. Of some 145 motors operating this equipment, 40 are on loading dock conveyors alone.

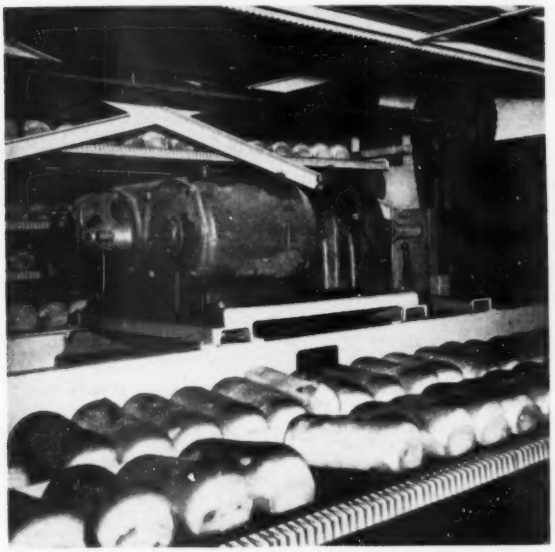
Largest oven is a 56-tray, single-lap, oil or gas fired, electrically operated and controlled traveling unit with automatic oven load and discharge features. It has a capacity of 6,000 loaves of bread per hour. Provision was made for future installation of a duplicate unit. A 22-tray oven of



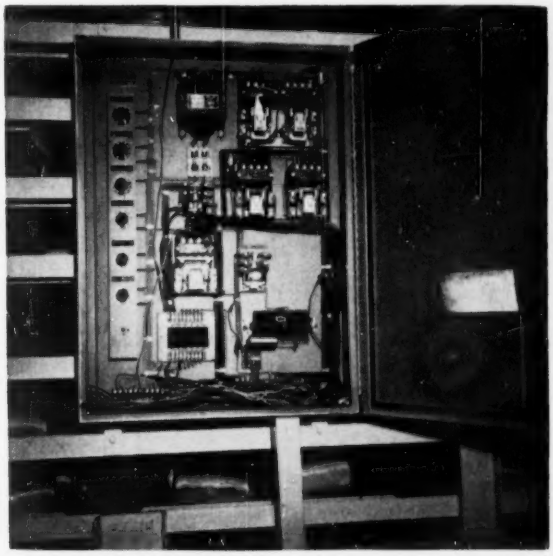
MAKE-UP CONTROL CENTER for motors operating divider, rounder, overhead proofer and moulder-panner. Dough from mixer (dumped into overhead hopper on divider) goes through these steps and emerges in pan-trays.



BAKED BREAD LOAVES in pan-trays are automatically discharged from large oven (6,000 loaves per hour capacity) onto conveyor leading to automatic de-panner (at right). Here pans are tipped over and bread continues to cooler.



MULTI-TIER OVERHEAD bread cooler (abut 85-feet long) takes loaves from de-panner conveyor; is operated by a 7½ hp, variable-speed motor equipped with a direct current clutch and magnetic brakes, plus auxiliary motors.



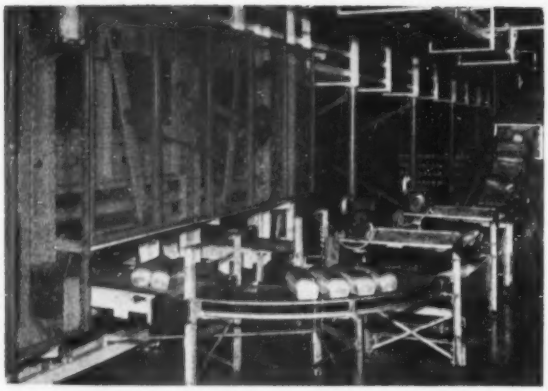
BREAD COOLER CONTROL panel houses magnetic starters for cooler motors and rectifier to supply the direct current for brake and clutch assembly. Note control wiring diagram kept handy in panel door.

similar design is used for variety goods (buns, etc.) and an 18-tray unit bakes sweet rolls. Do-nuts are produced in three electric friers; two of 35-kw capacity and one of 50-kw capacity.

This is the basic electrical system upon which bakery operation depends. Mechanization and automatic control begin in the flour storage department and continue throughout the plant processes, as indicated by the accompanying photographic sequence on bread production.

Newest of automatic bakery equipment is the pneumatic flour handling system. Forced air carries flour from the bag unloader through a sifter to the top of three storage bins with a total capacity of 50,000 pounds.. Two bins are normally used for white patent flour, one for clear flour. When mixers are loaded, flour can be drawn pneumatically (at 85 mph through 2½-inch pipes) from any one of the three storage bins, directed to any one of the four mixers and weighed automatically on a scale hopper above the mixer. Motor-operated blowers and solenoid-operated air valves on the piping are controlled from a central panel in the mixer room. All the operator does is to set two knobs; one for the storage bin, the other for the mixer. The rest is automatic.

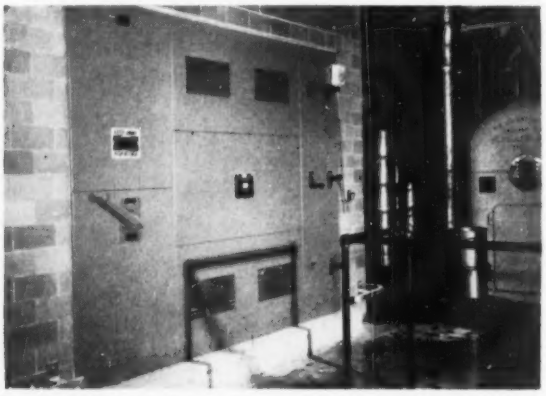
After the first mix, the batch sponge (1,200 to 1,600 pounds) is dumped into trolls and rolled into the fermentation room (vapor-proof electrical equipment) where temperature and humidity are controlled to definite limits. After remaining there for a specified time, the trolls are rolled out, lifted and tipped by an overhead electric hoist and the sponge is dumped into a mixer where final ingredients are added and the second mix takes place. The 1,600 pounds of bread dough are then dumped into another troll which is hoisted, positioned and tipped over a make-up hopper. From here on, the dough is divided, rounded,



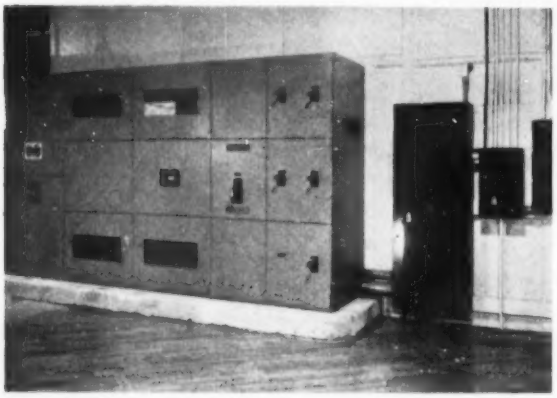
DUAL DISCHARGE conveyor spurs at base of cooler shunt bread to inclined belt conveyor which carries it to slicing and wrapping machines at other end of building.

FIVE-TIER CONVEYOR is final step in mechanized system; runs full length of truck loading dock so all delivery trucks can be loaded simultaneously.

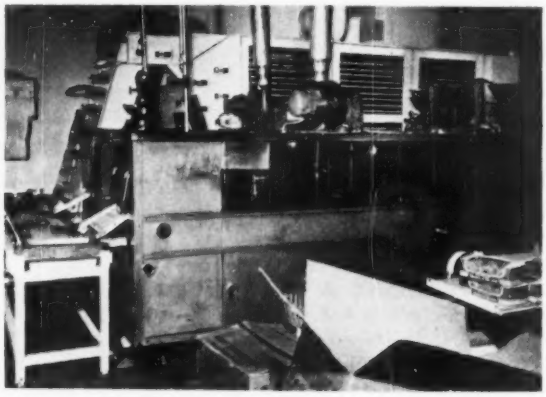
BY-PASS AND OFFSET in five-tier conveyor line serves second loading dock. Fifteen motors operate conveyor at this point. A total of 40 motors are on dock conveyor system.



FLUSH-TYPE UNIT substation of 300-kva capacity serves four mixer motors and power requirements in immediate area. Primary has fused load switch; secondary, air breakers.



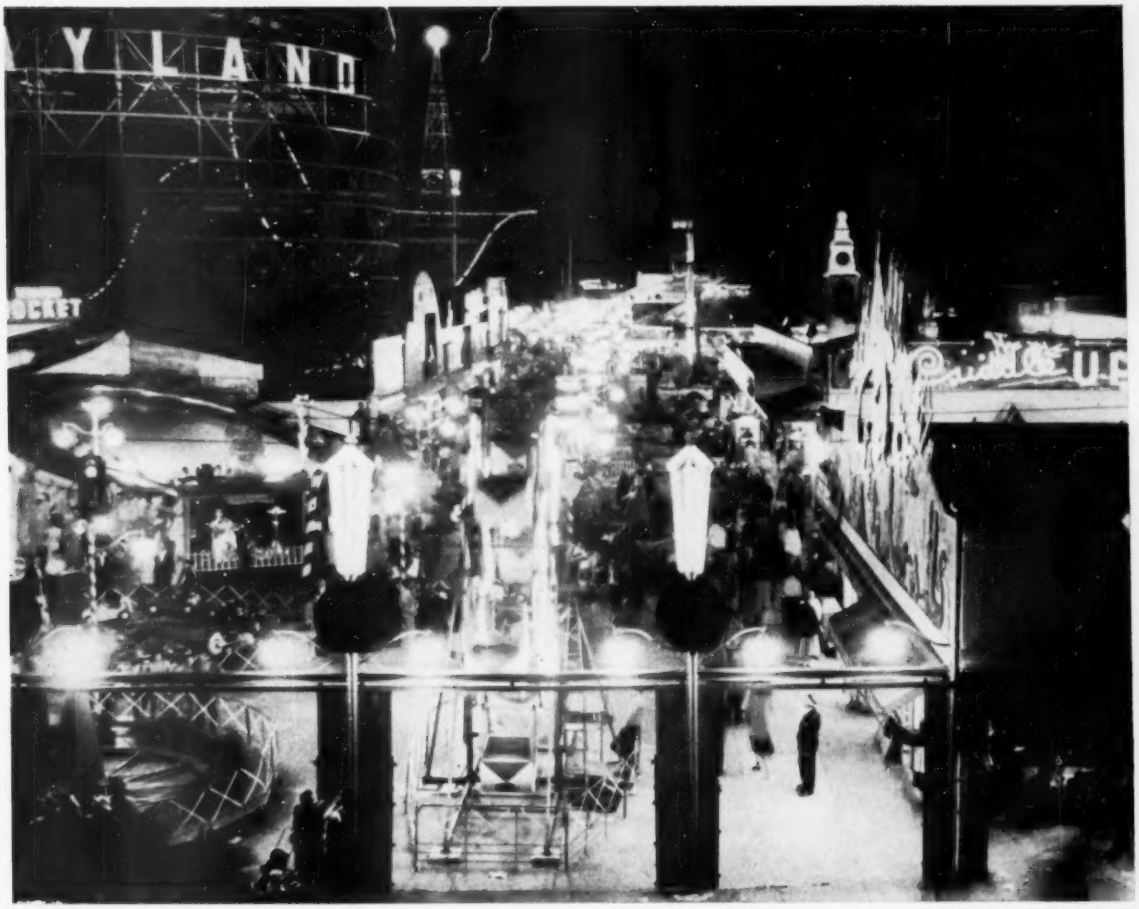
SECOND UNIT SUBSTATION of 500-kva capacity serves rest of plant; is fed by dual feeders which loop through first unit. Secondary distribution is in floor slab.



TWO ELECTRIC DO-NUT friers (each 35-kw) with conveyorized cooler in background form part of the mechanized do-nut production system. Packaged goods emerge on table.

passed through an overhead proof box and finally emerges in a moulder-panner machine in pan-trays. These are hand loaded on portable racks and placed in a proof box where the individual loaves are permitted to rise. From there, they go to a 56-tray oven, where the loaves are baked.

The hot bread is discharged from the oven on a roller conveyor section, then is carried up an inclined belt conveyor to an automatic de-panner. Here, the pan-trays are tipped over. The trays continue on a straight conveyor while the loaves of bread are carried on a bypass conveyor to an overhead bread cooler. After cooling, bread then goes onto a five-tier conveyor which carries it to the slicing and wrapping machines. The wrapped bread then goes onto a five-tier conveyor line which runs the full length of three truck-loading docks, from which route-men stock their trucks.



MIDWAY of Playland at Rockaway Beach, New York, presents a vari-colored assortment of fluorescent and incandescent lighting.

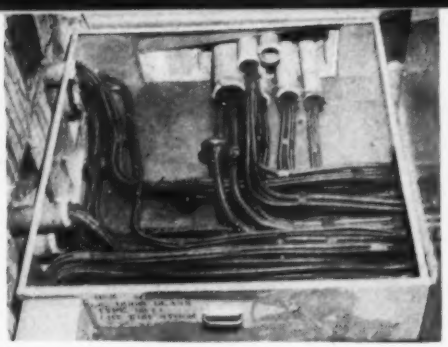
It Takes POWER To Play

Electricity plays major role in providing power, light and communications for summer entertainment at Rockaways' Playland

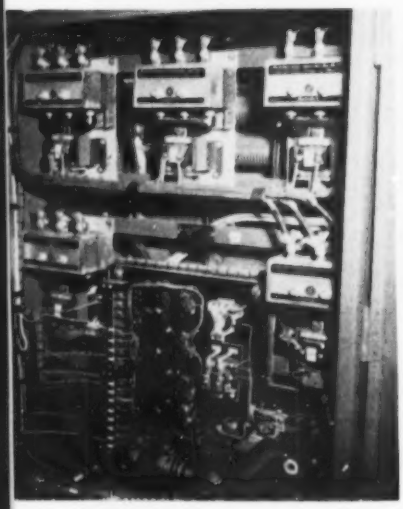
By W. J. Novak

ELECTRICAL requirements to match those of many medium-sized factories, both in quantity and diversity, are to be found at Rockaways' Playland, Rockaway Beach, N. Y. The growth of the large amusement park necessitated a complete modernization of its electrical plant last year. Furnishing the 65 rides and concessions with electricity for power and lighting was a complex system of open wiring consisting of 2-phase 4-wire, 2-phase 3-wire, 3-phase delta, 3-phase 4-wire Y, and single phase service. One by one the motors have been replaced or rewired for single-phase or 3-phase, 208-volt service.

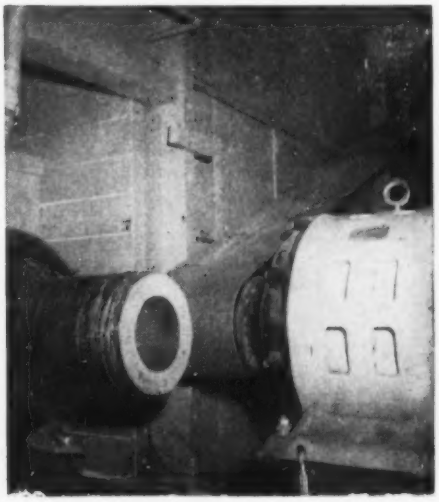
Under the supervision of H. & J. White, electrical contractors of Jamaica, New York, the variety of antiquated line switches in the old "switchboard" room were removed and replaced by a modern 2,000-ampere switchgear. The new switchgear is fed by seven $\frac{1}{4}$- by 4-inch enclosed bus bars (two per phase, one for ground) from a 2300-volt vault housing two Y-connected transformer banks plus an additional single-phase transformer—a total of 500 kva.



NEW SWITCHGEAR (right) represents quite an improvement over antiquated variety of line switches (left) that existed before modernization of electrical plant was accomplished. All feeders leaving switchgear pass through large pull-box (above) measuring 48 by 48 by 12 inches and located beside switchgear.



CAROUSEL is accelerated from rest to full speed by specially-built 6-step controller in 1.6 seconds.



ROLLER COASTER 75 hp drive motors are alternated by the addition or removal of a short length of pulley belt.

SKOOTER car motors receive power from chicken-wire overhead; circuit is completed by grounded floor plates.

All conduit runs carrying cables from the switchgear terminate in a large pull-box measuring 48 by 48 by 12 inches which is adjacent to the switchgear. The cables, ranging in size from No. 2 to 500,000 CM in conduit as large as 4-inch, feed lighting cabinets and motors throughout the park. Motor sizes range from 1/3 to 75 hp. The 75 hp motor is used to drive the chain of the Roller Coaster featured in the recent film *Cinerama*. An additional identical motor is mounted in place as a spare, the two being used alternately with one on hand in case of emergency. A 7-step manual controller brings the motor up to speed. The continuous chain, located between the tracks carries the cars up inclines, but the cars are free-rolling on the downgrades.

The frequent starting and stopping of Playland's giant Carousel is accomplished by a six-step automatic starter specially built by Wm. H. Ludwig Motor Repair Shop of Brooklyn, N. Y. The starter brings the 10 hp drive motor smoothly up to speed in 1.6 seconds. All rotating rides in the park are controlled through multiple-step starters by pushbuttons or automatic timers. Timers have ranges of from 1 to 15 minutes and insure equal duration of rides, the average ride being of three minutes.

A 110-volt, single-phase circuit fed by a 50 kva transformer through a special 600-ampere knife switch in the switchgear vault carries power to the "skooter", one of the park's most popular rides. The 1/3-hp special-built motor in each of the 45 electrically-driven cars receives its power through a shoe at the top of a vertical rod extending from the car. A suspended screen made up of approximately 5600 square feet of chicken wire constitutes the hot side of the line, which is engaged by the shoe. A 500,000 CM cable carries the current from a magnetic starter to more than one hundred 3/0 connecting wires energizing the screen at each edge and along the center. The entire floor area over which the cars operate is made up of ¼-inch steel plates connected to the main system ground and which provide the return path for the motor current.

Attractive lighting is recognized as a strong sales point in the park, and new fixtures are constantly being installed to replace those found to be inadequate. Lighting standards illuminating the Midway were originally purchased from the New York World's Fair and combine banks of fluorescent lamps with 300-watt tungsten bulbs in spherical glass shades.

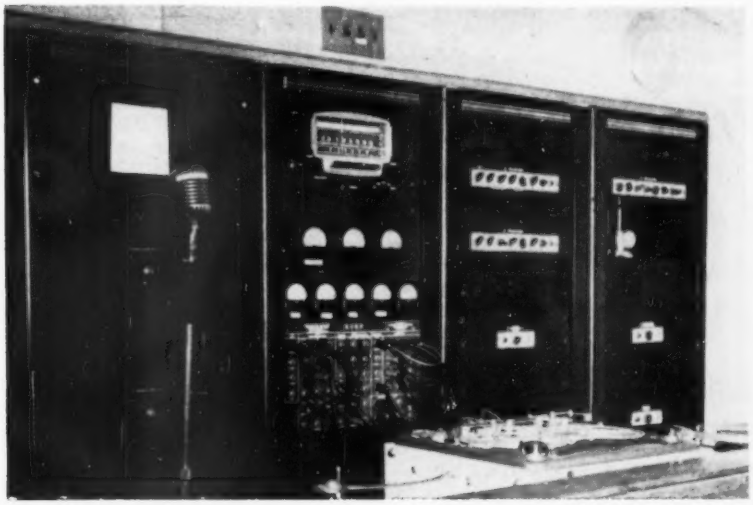
Furnishing light to most of the rides are Work-O-Lite fluorescent fixtures containing vari-colored 20- and 40-watt lamps. A variety of collector rings are used to supply current to the rotating fixtures. Increased patronage of the park's Arcade has followed the recent installation of continuous T-12 slimline lamps in 4-lamp Work-O-Lite fixtures to replace old individual 3-lamp units.

Coordinating activities throughout the park is an extensive communications network installed by Hughes Sound System of Rego Park, L. I., New York. The heart of the system is a control room in the new air-conditioned office building. A patching panel permits the piping of announcements or recorded music from any of four turntables, two juke-box mechanisms, four Webster-Chicago tape recorders, or a microphone to various points on the Midway, the beach, or the Kiddie Park; or sound effects to such concessions as "Hell n' Back" or "Davy Jones' Locker." Programming is carried to the Midway over 360° Atlas speakers using the new constant-voltage system of matching.

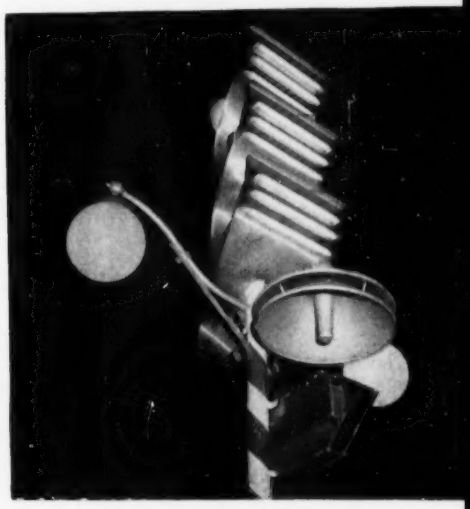
Conduit is in place for the installation of television cables in preparation for expected telecasts from Playland this summer. Directing and monitoring will be done from the control room, replacing the mobile bus of the past.

A dual telephone switchboard system services the park, permitting interpark or outside calls to be handled at either of two boards, their use being determined by whether the park is open or closed. Microphones are available to switchboard operators and receptionists for summoning personnel anywhere in the park.

At peak periods this variety of power, lighting and communications takes a total of 1200 amperes per phase from the two sets of transformers feeding the park. This sizeable amount of current attests to the large part played by electricity in furnishing New York's summer crowds with power to play.

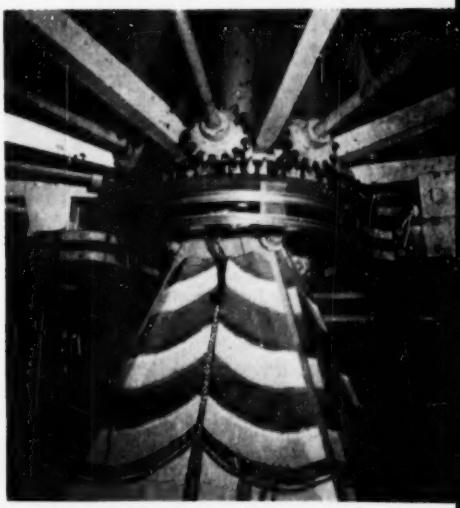


CONTROL ROOM panels include turntables, FM-AM radio, meters, patching board, Masco 70-volt, 125-watt Hi-Power amplifier, and preamplifiers. Tape recorders are used for recording announcements and sound effects.



LIGHTING STANDARD combines banks of fluorescent lights with 300-watt incandescents, mounts 360° Atlas speaker.

ARCADE showed increased patronage after recent installation of continuous T-12 slimline fixtures. Level of illumination produced by former individual 3-lamp units has been doubled.



COLLECTOR RINGS and shoes on Kiddies' Merry-Go-Round carry current to rotating lighting fixtures.

"NOT HOW WE RATE OURSELVES but how we rate with our customers" expresses Calewo's belief that "salesmanship starts with sale of good will." This approach, conscientiously followed for three decades, underlies the growth of 3 partners with little capital to 10 partners, 150 employees, 2500 customers and net physical worth of $1¼-million.

By
Hugh P. Scott

Some Practical Ideas For . . .

EFFECTIVE

California Electric Works in San Diego—a fast-growing ten-partner contracting firm doing all types of electrical work—has a wide-awake promotion campaign that ranges from steak dinners and clever direct mail to informative radio shows, inspection tours and demonstrations.

PUBLIC understanding and appreciation for electrical theory, design, installation and maintenance is receiving a tremendous boost from a continuous promotion campaign being carried on by a ten-partner electrical contracting firm in San Diego, California. The campaign is educational, telling the public "what's new" in an interesting, non-technical manner that merits widespread approval. It is also practical, presenting useful data, methods and suggestions for electrical construction, modernization and expansion. And it is gratifyingly effective, bringing wide recognition to the sponsoring company.

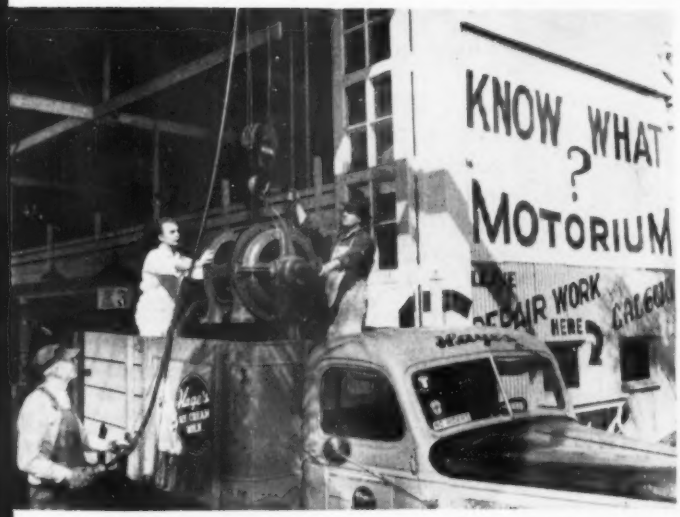
This recognition—together with the added business it fosters—would of itself justify the effort and money being devoted to the campaign. Yet other and more significant results are evident as well, for it promotes the prestige of the entire electrical contracting industry in the eyes of the public and it convincingly represents the Contractor as a necessary and important professional member of society.

Promotion is primarily beamed toward those with a direct interest in wiring, power, motors, lighting and electric heat. Yet it also includes such diverse groups as school boards, utility men, members of the Chamber of Commerce, city electrical and marine inspectors, students and civic associations. As a result, the city is showing a healthy interest in all phases of electrical construction, and is surprisingly well informed as to the operations of "Calewo"—trade name for the California Electric Works.

For example, Calewo frequently invites representative members of these various groups to attend informal luncheons or steak dinners which are served in an attractive exhibit room located on the second floor of the company's multi-department building. Around this room are models and interesting displays showing such up-to-the-minute ideas as touch-plate switching, remote relay control, trolley and plug-in busduct, step-by-step motor repairing, load-center distribution plans and the like. Displays also include photographs of outstanding or unusual electrical installations, blueprints to show types of engineering handled, typical estimating forms, time sheets and bookkeeping samples.

Short tours of inspection precede each meal, to show guests how the company handles every-day operations. They see employees with sleeves rolled up literally and figuratively, not "dressed for company". They are encouraged to ask questions of motor repair men, stock clerks, draftsmen and engineers, salesmen and shipping personnel.

Meals are followed by brief demonstrations or discussions on various phases of marine or line work, interior wiring, lighting design or industrial maintenance. These talks are pre-



ON ITS WAY to a customer goes another "good as new" motor which has been rebuilt, tested and guaranteed in a shop where modern equipment, 40 experienced men and round-the-clock operations guarantee fast, reliable service.

COFFEE AND DOUGHNUTS are served without charge to customers calling at Calewo's service desk to pick up motors, wiring accessories or appliances. This service pleasantly fills interval while orders are being written up.

BUSINESS PROMOTION

sented at a fundamental level, to show the non-technical guest why adequate wiring is important in a residence, how a circuit breaker works, the reasons for a motor failure, the requisites of a good lighting installation and the wisdom of Code rulings.

These get-togethers with all segments of the community are brief, friendly, non-technical and non-partisan in the sense that Calewo is rarely mentioned by name. Guests are free to draw their own conclusions—and they generally do—that Calewo is a progressive outfit, qualified to handle all types of electrical work.

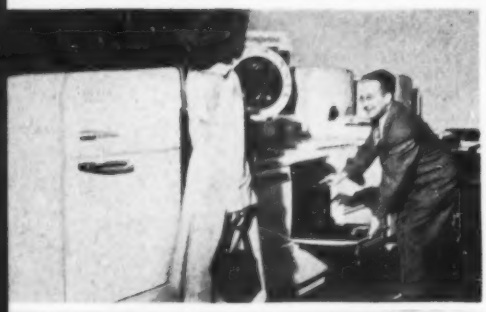
Personalized Promotion

While company-sponsored dinners play a big part in this campaign, other mediums are exploited, such as newspapers, radio and TV, direct mail, talks before local trade and civic groups, attractive signs on trucks and on buildings where work is being done.

Direct mail includes brochures describing methods and tools used by the company, jobs just completed or still in progress, useful data sheets such as footcandle recommendations for

THESE LIGHTS ARE OUT—but not for long, since emergency crew is on call at all hours, day or night. This early-morning picture shows two Calewo employees repairing a directional landing marker at San Diego's Lindbergh Field.

METER READINGS, taken in customer's presence, provide powerful sales points for engineer urging circuit improvements.

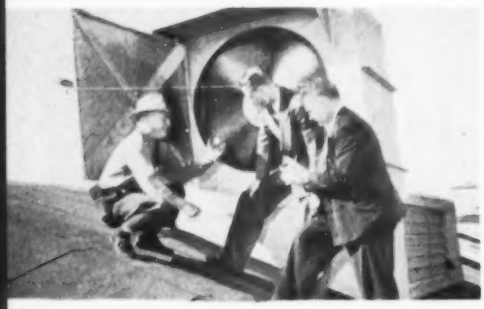


Looks like you're going to have a job for an Electrician, need some wiring, Lighting Fixtures, Electric Motors, Appliances, or "Sum thin"

Sure hope you will call M-2145

THANK YOU ***California Electric Works***
424 8th Ave., San Diego

By _____

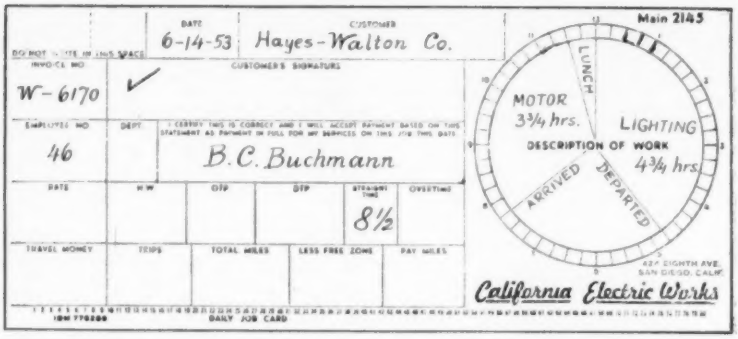


Call
CALEWO
M 2145

Just to say "Thank You" for the favor of

Do it again *California Electric Works,*

VARIETY OF CARDS are used to promote customer good will, curiosity and interest in electrical modernization, maintenance or construction. Incidental expense and time devoted to this follow-up is amply justified by "plus" business; card recipients quite often become new customers.



DAILY TIME SHEET is filled out in duplicate by the workman on the job. It is approved by the customer who retains a copy for his own records. This constitutes a handy reminder of the nature of the work and the hours spent on the job, certifies to the customer that there is no time padding and fully explains the subsequent bill.

various installations, full load current of motors, ampere capacity of wire for varying lengths and sizes, changes of air required for summer cooling comfort. Blotters are used to advertise motor service, company personnel and appliances on sale, but, in addition, they are used to promote civic projects as well—such as appeals for the Red Cross, the donation of blood for the Armed Forces and the like. Monthly postal cards show pictures of Calewo men working in the shop, drafting room, or on the job. On the backs of these cards messages are personalized, being written in the first person, ending with a cut of one of the partners' signatures, and presented as a short typewritten informal message such as:

"This big exhaust fan unit was installed at Hopkins News Agency. In the picture I have an air speed indicator in my hand, checking the breeze with Johnny Anderson of our sales department," or "Here's the beautiful new store just completed for Pitts, the Truck Man, on 6th Avenue. The ceiling is a Skyglo luminous louvered system," or "Here's how we check voltage regulators on the main power panels of tuna ships operating out of San Diego. . ." (signed) Pink Knight, general manager; or Dick Jameson, superintendent; or Norm Ferguson, sales manager, etc.

Another type of card which creates considerable interest, humor, curiosity and good will shows a sketch of a person shaking hands with "the gang at Calewo". Pictures of individuals are selected at random from daily newspapers, then the heads are cut out and mounted over the body in the cartoon. Depending on the nature of the news story accompanying the newspaper photo, the post card merely says "Howdy" or "Congratulations". In those cases where the recipient of the card does not know the meaning of "Calewo", he generally asks questions or checks the telephone book to satisfy his curiosity, then frequently phones or calls to say "Thanks", and quite often becomes a new customer.

Whenever signs, notices or "grapevine gossip" indicate that any alterations or new work is contemplated another type of card is used, saying, "Looks like you're going to have a job for an electrician. Do you need some wiring, lighting fixtures, electric motors or appliances?" This card is a double return self-addressed one, with a convenient check-list of available services for the prospective customer's use. It is a simple device for obtaining "plus" business, and results more than justify the incidental time and expense involved.

After each job has been completed, another type of check-list is sent to the customer, saying, "Thank you for your business. It was a pleasure serving you. Have we handled the job to your satisfaction? Were we prompt? Were our workmen courteous? Did we clean up properly after the work was done? Would you want the same workmen back again? Are there any items on our bill which you would like explained?" This interest in the customer's reactions, the request for his comments and the indication of a willingness to cooperate with his wishes is an unusual gesture which is sincerely appreciated.

Customer-Approved Time Sheet

Another indication of Calewo's customer-relation policy is emphasized by the use of workmen's daily time sheets, signed in duplicate by the customer at the time a job is completed. These time sheets carry a large clock dial, with pencilled marks and notations to

(Continued on page 192)

Outstanding Electrical Construction

By F. W. Call

General Plant Engineer
Chevrolet Cleveland Parts Mfg. Div.
General Motors Corporation

AIR VIEW of huge Chevrolet plant shows roof-based substations and indicates underground entrance of high-voltage primary service.

CHEVROLET of CLEVELAND

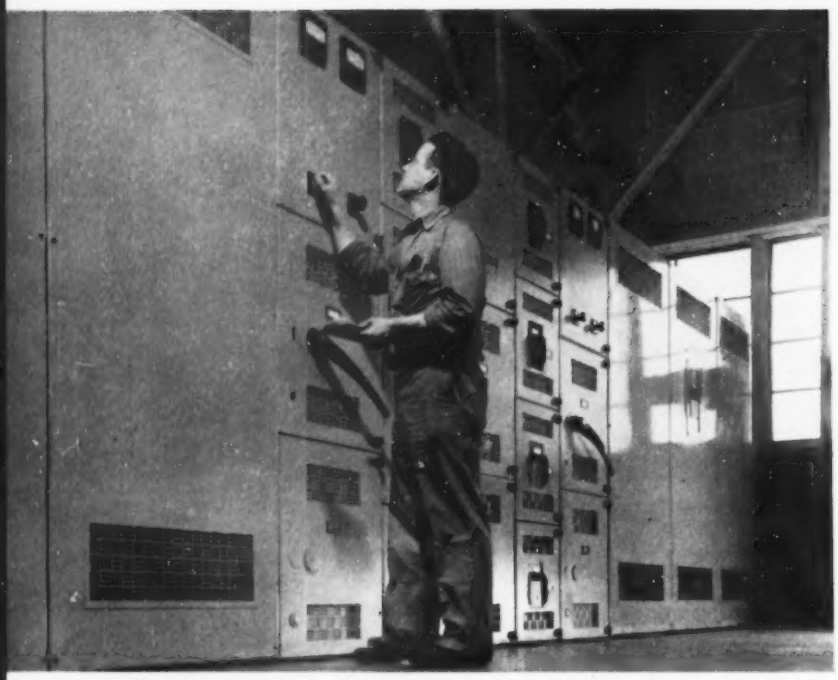
Thirty acres under a single roof, 11-kv primary distribution, 5 substations with a combined capacity of 16-million volt-amperes, 50,000-hp in electric motors, 19,000 lamps, a monthly power consumption of 4½-million kwh and a plant power factor above 97% are a few of the impressive figures related to Chevrolet's largest and most modern production center. Wired by Hatfield Electric and Fischbach-Moore, this installation constitutes a summation of practical ideas which may advantageously be adapted to scores of smaller industrial installations across the nation.

CHEVROLET'S new assembly plant in Cleveland, Ohio, is the largest and most modern of that company's 15 U. S. production centers. Here, under a single roof covering 30 acres, more than 2000 high-precision Powerglide transmission assemblies are produced every day, while pressed metal parts and propeller shafts for both pleasure cars and trucks demand the services of scores of heat treating devices (convection, induction, infrared and salt bath), nearly 19,000 lamps (mercury, fluorescent and incandescent), five substations containing a total of 20 transformers with collective capacities of 16-million volt-amperes, over 50,000-horsepower in electric motors required to operate cranes, conveyors, presses, machine tools and testing apparatus, and 6000 employees.

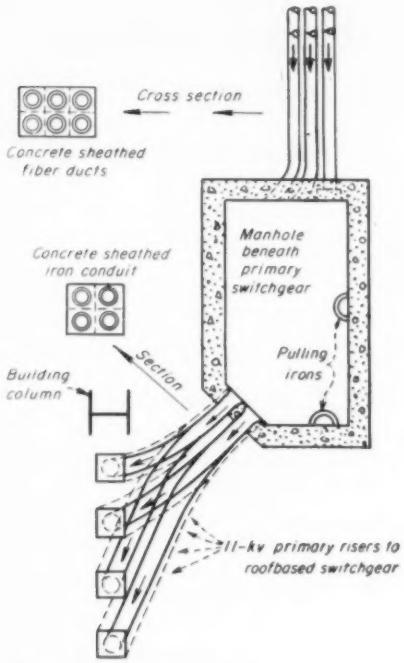
Powerglide production at Cleveland is complete, starting with foundry operations, then mass machining on such special tools as massive gear shapers, multi-matics and transfer-matics. Parts are then conveyorized to glass-enclosed assembly rooms where the atmosphere is kept dust free through the use of electrostatically-filtered air. Other conveyors carry assembled transmission units to a testing room where all normal operating conditions are simulated by motorized equipment. Finally, transmissions are transferred to shipping docks using electric materials-handling industrial trucks and dispatched either by truck or freight car to one of Chevrolet's 11 nationally-scattered assembly plants.

Analysis of the plant reveals sound engineering, the result of plans developed by architect-engineers F. A. Fairbrother and George H. Miehls of Detroit. Practical installation methods and quality workmanship reflect the abilities of the electrical contractors, Hatfield Electric and Fischbach-Moore. And the general operating efficiency of all electrical equipment is a tribute to an excellent maintenance program being carried on continuously by Chevrolet's own electrical division.

While these methods and techniques are practiced on a large scale in this modern Cleveland plant, all of them can advantageously be adapted to smaller industrial installations as well. A study of this installation therefore reviews and summarizes scores of ideas which can be put into everyday use by contractors all over the country.



PENTHOUSE SUBSTATIONS contain separate transformers and breaker cubicles for power, lighting and welding use. Transformers are air-cooled dead-front units having 3-pole primary disconnects.



PRIMARY SERVICE enters the plant underground, is carried upwards to penthouse switchgear in iron conduits.

Primary Distribution at 11-kv

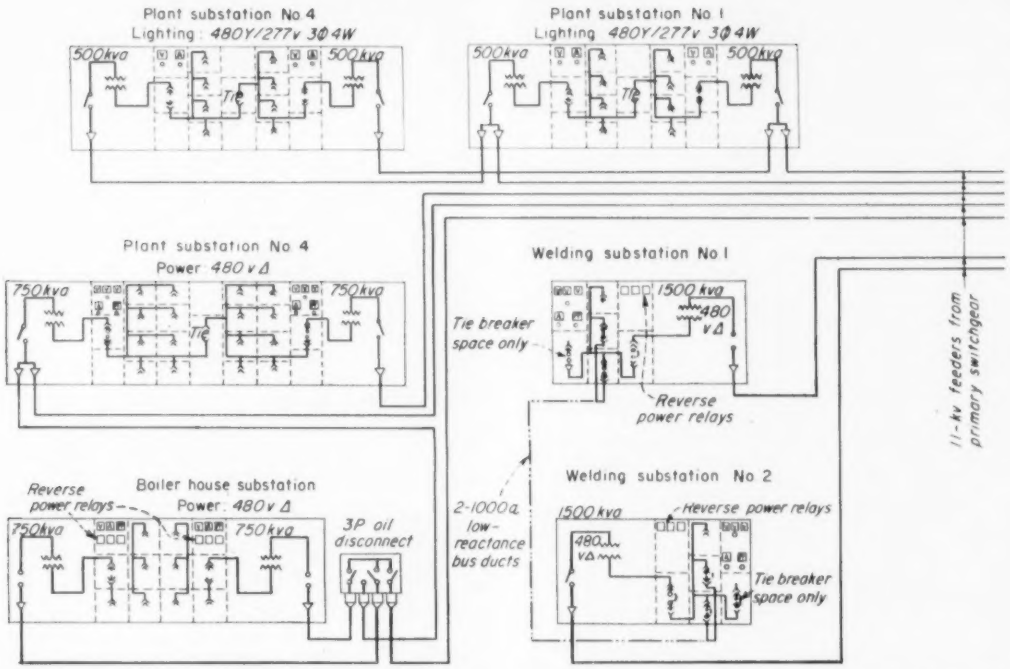
HIGH voltage current at 11-kv is carried underground from utility distribution lines directly into the plant, then is carried upwards to roof-based primary switchgear and substation penthouses where transformers, secondary feeder and tie breakers inaugurate separate services for plant-wide lighting, power and welding applications. Incoming 11-kv power and primary distribution is 3-phase 3-wire 60-cycle grounded; power and welder distribution is 480-v 3-phase delta, while lighting systems are generally 277/480-v, 3-phase, 4-wire grounded. Lighting in office areas, the boiler house and some sections of the manufacturing plant is 120/208-v grounded wye, provided through dry-type transformers installed near local load centers as required.

Incoming primary cables are 15-kv lead-sheathed 3-conductor type H ungrounded-neutral runs, carried underground through six 4-inch fibre ducts encased in concrete between manholes, supported by a sub-base wherever the nature of the ground indicates possible settling, and pitched toward manholes for proper drainage. Manholes are of cast steel and reinforced concrete waterproof construction, equipped with pulling eyes, chamfered duct entrances, cable racks, sumps, and ground rods to which clamps and 4/0 bare stranded grounding copper cables are brazed. To preclude the possibility of damaging lead sheathes while cables were being pulled in, a petroleum-base lubricant was used for the entire length of each run between manholes and, to safeguard cables against possible fire damage, all cables and splices in manholes (as well as in all pull-boxes and vaults) are protected by asbestos coverings. At points where ducts enter manholes, cables are also covered with fire-felt saturated with silicate of soda and retained in position by jute twine.

Cables are accurately identified in each manhole by means of fiber tags wired to feeders and wherever primary 11-kv cables are run under wood-block floors, the routes are marked by metal markers on 2-foot centers. When high-tension cables pass through walls or beneath finished concrete floors, their position is plainly marked by a painted red stripe and the voltage prominently indicated. Primary cables running from manholes to roof-based switchgear and substations are varnished cambric and lead-covered, carried within vertical galvanized steel conduits which are secured either between the flanges or closely adjacent to structural H-columns of the building.

Separate Subs for Power, Light, Welding

Concerning the four electrical penthouses, the largest (measuring approximately 50-by-80 feet) contains two 13-cubicle primary switchgear banks, a 3000-kva double-ended substation for power, a 1000-kva double-ended unit for lighting and a 1500-kva single-transformer sub (with an electrically operated tie breaker to permit the future addition of a duplicate trans-



ABBREVIATED 1-LINE DIAGRAM shows 11-kv feeders extending from primary switchgear to 10 of the plant's 20 transformers. Double-ended load-centers with tie breakers, reverse power relays and use of multiple-pothead connections are features of the installation.

former if required) for welding. A second penthouse contains power, lighting and welding substations having these same capacities and characteristics, while each of two remaining roof-top enclosures contains a 1500-kva power unit and a 1000-kva lighting sub. A fifth power substation located inside the separate-structure boiler house, consists of two 750-kva transformers connected to a common 480-v bus structure through 1200-amp breakers. Together, these five main substations contain 20 transformers with a total rating of 16-million volt-amperes.

All transformers are streamlined air-cooled indoor-type units having two full-capacity taps above and two full-capacity taps below their rated high voltage levels, and a ratio adjuster which is interlocked to prevent its operation except under a no-load condition. All penthouse transformers have 3-pole disconnect switches on their primary sides, with either one or two 3-conductor potheads, depending upon whether the transformer is being served by a separate or common 11-kv feeder from the primary switching center. Transformers at the power house are normally fed by a primary feeder running directly from the main switchgear, and a 3-conductor pothead with entrance from below for service connections. Emergency protection for boiler house equipment is provided by a second feeder extending from one of the penthouse stations, terminating in a 3-pole oil disconnect as indicated in the condensed 1-line primary distribution diagram shown on this page.

Switchgear Characteristics

Low-tension feeder switchgear in all power substations is of dead-front construction, completely factory-assembled and wired with draw-out trip-free air circuit breakers. Breakers having ratings above 1600-amps are electrically-operated, truck-mounted. Each self-supporting welded-steel enclosed cubicle is divided into two compartments; front sections containing breakers and operating mechanism while rear sections contain bus bars, cables and conduit.

Welding unit substations are similar, except that main breakers not only have overload and short circuit protection but, in addition, have reverse power relays to prevent power from flowing from the secondary bus to the transformer instead of vice versa. This is necessary since both welding substations serve the same two 1000-amp low-reactance plug-in busducts. Reverse power relays and tripping coils are operated at 48-v dc.

Lighting substations likewise have the same general switchgear characteristics as power units, but each of the natural-convection air-cooled transformers has provision for forced air-blast operation as well, to boost kva output ratings if required.

All of these transformers have 11-kv 3-phase delta connected primaries, and all primary feeders are monitored at the main switching station, which is incorporated in the largest of the four penthouses as previously mentioned. Main switchgear cubicles are equipped with removable electrically-operated trip-free single-throw air circuit breakers, primary and secondary disconnecting devices and mechanical interlocks.

Accessory equipment at switching center includes an inspection panel complete with secondary contacts, control relay and control switch, a transfer truck with a lifting device to permit loading the breaker unit when required, a closing lever for manually operating the breaker, and a device for operating the elevating mechanism.

PLUG-IN BUSDUCT is carried in trenches through the press shop, with 480-volt power delivered to them from roof-housed substations through 50MCM cables. Trenches are covered by removable non-skid steel plates; switchgear is vaporproof.

SPLIT-BUS low-reactance distribution for welding is carried through the plant via two 3-phase 1000-amp busducts mutually served by two 1500-kva substations equipped with reverse power relays to preclude feedback.

480-Volt Overhead Busduct

SECONDARY power at 480-volts is distributed from the load side of substation breakers to busduct tap boxes, control centers and power panels via 600-volt cable in conduit, cables being insulated by varnished cambric and braid except in locations subject to moisture. There they are lead sheathed.

Three-pole 400-amp plug-in power busduct is generally carried through the plant overhead along column lines, supported every 5 feet by trapeze hangers and adequately sway-braced to withstand any lateral thrust normally placed upon it by maintenance men working on ladders inclined against bus enclosures. All overhead buses are powered through tap boxes and are equipped with lightning arrester plugs.

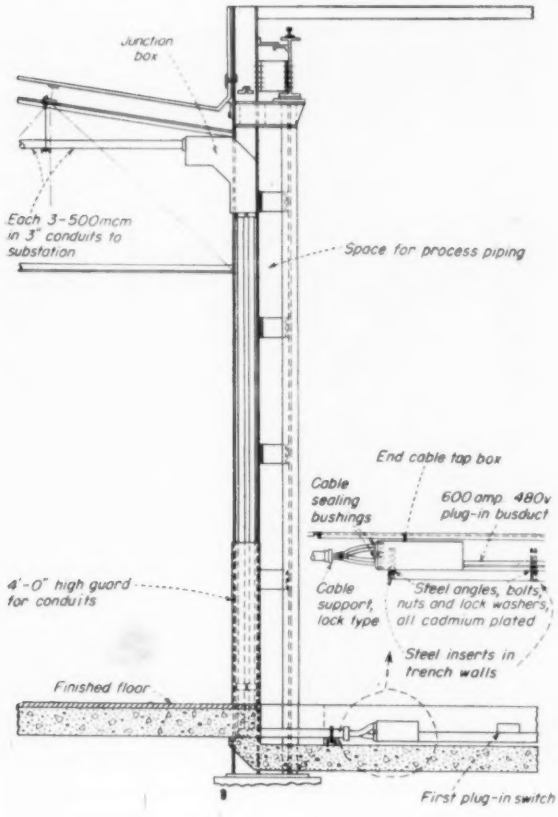
On three separate occasions since completion of the plant, groups of capacitors have been installed along bus runs and at substations in order to maintain high power factor values in the factory. Each group installation clearly proved the value of these additions, inasmuch as the first installation resulted in raising the plant power factor from 55% to 82%, the second resulted in jumping pf from 60% to 98%, and the third boosted pf from 70% to 97.3%—where it now stands.

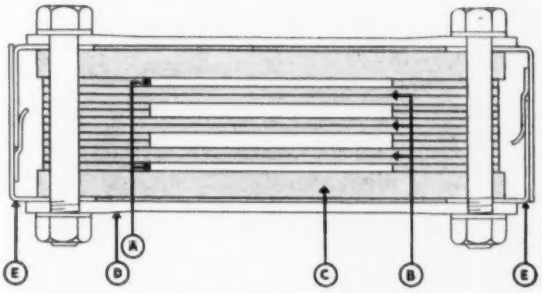
The gradual decrease of pf between each group installation of capacitors was directly attributed to the steady growth in the connected load for, since the factory commenced operations, loads have constantly risen to their present averages of 14,000-kw per hour, 180,000-kwh per day and 4,500,000-kwh per month. These totals are impressive, yet it is anticipated that full-capacity round-the-clock operation will eventually push daily consumptions to 280,000-kwh and monthly totals above the 7-billion kwh mark. This increase will inevitably reduce the plant power factor again and will once more dictate the addition of capacitance to the system. Capacitor ratings are now 60-, 120- and 360-kvars, with gross installed capacitance already exceeding 30,000 kvars.

Trenches Carry Press Power

In the press shop, where banks of brawny presses stamp out over 350 tons of truck fenders, engine hoods and running boards each day, 480-volt busduct is carried in 18-by-18-inch trenches recessed in the wood-block flooring. Trenches are covered by sections of removable non-skid steel plate.

Feeders from roof-housed substations to each of these floor trenches consist of six 500MCM cables, carried in two 3½-inch conduits located between flanges against the webs of structural H-columns. Conduits are protected by steel guard plates bolted across flange lips from the working floor to a height of 4 feet. Feeder


Junction box
Each 3-500mcm in 3" conduits to substation
Space for process piping
End cable tap box
Cable sealing bushings
600 amp 480v plug-in busduct
4'-0" high guard for conduits
Cable support, lock type
Steel angles, bolts, nuts and lock washers, all cadmium plated
Steel inserts in trench walls
Finished floor
First plug-in switch



CROSS SECTION through welder bus shows split-bus construction (a), insulated space between buses of unlike phase (b), special insulation to provide arc and moisture resistance (c), surge clamps (d) and steel side-closing channels.

UNDERFLOOR PLUG-IN DUCT in press section is served through end tap boxes by 500MCM cables carried downward from the truss level in the web cavities of structural H-columns. Column webs are enclosed to guard feeders against physical injury.

conduits terminate at busduct tap boxes, through lock-type cable supports and cable-sealing bushings. All switches and plug-in receptacles in the trenches are vaporproof.

Split-Bus Design for Welding

The separate 480-volt 3-phase 1000-amp busduct distribution system for welder power loads is served through two substations, as indicated in the 1-line diagram. It is of the "one split bus" type, designed to equalize and minimize voltage drop, heating and burning. Bus bars of opposite polarity are separated from each other by non-absorptive insulating plates having high heat-dissipating qualities. In addition, each group of bus bars is enclosed by insulating plates of asbestos composition. Buses and insulating plates are closed at top and bottom by steel channels and the entire structure is retained by heavy surge clamps designed to resist stresses resulting from any possible short circuit up to 50,000-amps.

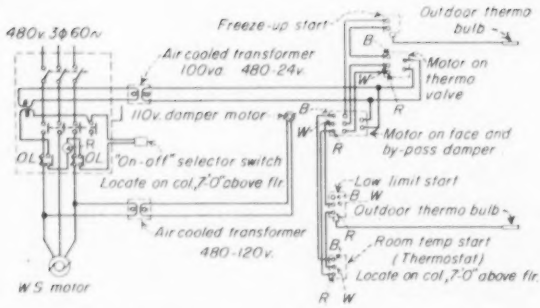
For the heavy welder loads experienced at Chevorolet, the split-bus duct is exceptionally desirable since it provides a compact conductor with about ¼ normal voltage drop. This results in greater capacity with better welder performance. The absence of a complete steel enclosure greatly reduces iron losses and power hum. It also eliminates the characteristic pulsations generally developed by the sudden creation of heavy welder loads. Since the insulating plates are dense, strong, impervious to moisture, resistant to arcs and high in thermal conductivity, it is possible to operate the buses at higher current densities.

These permissible overload characteristics result in copper savings by permitting greater ratings, and the close spacing of the bars together with the "one split bus" arrangement makes it possible to increase distances of service by 50% or more while staying below any stipulated permissible drop for single phase welding.

Power Control Centers

All 480-volt 3-phase 3-wire power panels are dead-front construction, with double solderless lugs in mains and 3-pole fusible switch units for branch circuit control. Switch units are equipped with removable multi-spring high pressure double-break jaws equipped with arc suppressors. These power panels, together with motor starters and related equipment, are grouped into compact control centers, factory assembled to insure coordinated, rigid assemblies. Each individual section in these centers is provided with a horizontal wiring trough, lined up with similar troughs in adjacent sections to form continuous pull boxes which are accessible from the front by the removal of filler plates.

Motor starters are of the combination line type, consisting of fused disconnects and full-voltage magnetic starters with manual resetting, thermal overload and no-voltage protective features. Disconnect switches, capable of being locked in the "off" position, are interlocked with panel doors to insure their disconnection during inspection or maintenance routines. Red and green indicating lamps are mounted on panel fronts to show the position of motor starters at all times.



WINTER AIR SUPPLY units are operated through plug-in breakers connected to 480-volt power busducts. Air cooled transformers step current to 110-volts for the operation of damper motors; to 24-volts for control circuits.

POWERGLIDE TRANSMISSION assemblies are completed and tested under electrostatically-filtered air conditions. Power tools for nut spinning, screw driving, drilling and grinding are operated at 360-cycles.

Super Cycle Tools

ELECTRICALLY operated tools for nut spinning, driving screws, drilling and grinding metal surfaces of components moving along Chevrolet's assembly lines are powered by 360-cycle 208-volt ac, transformed from 480-volt 60-cycle current through synchronous motor-generator frequency-changing sets. This power is distributed by modern all-purpose trolley busway systems, providing power outlets to all points along the entire duct lengths. Made up of standard, factory assembled units, these busways are tailored to fit exact requirements of assembly lines. And, since rolling take-off trolley outlets move with the tools, there are no trailing cables to create tripping hazards. The tools themselves are supported by spring-tension balancing devices and reel-wound stranded cables, thereby lessening the fatigue of operators and maintaining peak efficiency for longer intervals.

With 100-amp current-carrying bus bars enclosed in sturdy steel track sections, and with trolleys themselves effectively insulated, the danger of accidental contact with live circuits is removed. Another plus value is found in the ease of maintenance, since bus bars may be readily cleaned by inserting an emery cloth holder in the track and pulling it back and forth until all grease, carbon or other foreign matter is removed.

Trolleys are equipped with hanger-type non-fusible cabinets and 3-phase 3-wire 4-pole fused and grounded plug connectors.

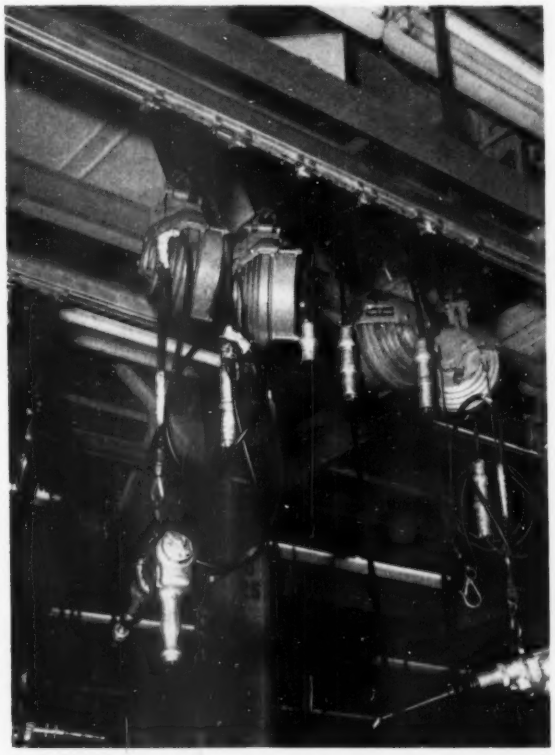
Many permanently positioned machines are also served through flexible drop cables, although the power distribution system for this use is 480-volt plug-in duct rather than 208-volt trolley. Drop cables range in size from 12 gauge to No. 6, depending upon motor capacities, and they are kept taut—but not tensed—by coil rewinds and spring mountings.

Throughout the plant, wire and cable is generally type R for dry branch circuits, lead covered in slabs over unexcavated portions or in damp locations, and type V for feeders, run continuously without splices from outlet to outlet. No wire smaller than 12 gauge is used and all wire of 8 gauge or larger is stranded double braid.

In office areas distribution is via steel underfloor ducts, two duct systems being installed parallel to each other. One is used for low tension branches, the other used for 120/208-volt 3-phase 4-wire service. Where cross-overs of high and low tension ducts occur, offsets are made in the 120-volt runs; the telephone lines remaining at the same level throughout the area. For the purpose of accurately locating outlets, distinctive markers for the two systems are located in the finished floor covering over those outlets which are adjacent to junction boxes. Duct runs are also marked at their end points and at both sides of all partition lines. All joints at junction boxes, fittings and couplings are made watertight through the use of a bitumastic compound.

Materials Handling Facilities

Materials are received, passed through the plant from one prepara-



MOVABLE TROLLEY power take-off units equipped with hanger-type non-fusible cabinets and 3-phase 3-wire 4-pole fused and grounded plug connectors provide super-cycle tools with 208-volt ac from 100-amp enclosed busways.

ALL-ELECTRIC KITCHEN, capable of serving 5000 meals daily, is equipped with ranges, ovens, dishwashing tunnels, pass-through cold cabinets and complete line of equipment for preparing, refrigerating and serving tasty food.

tion point to another, and finally delivered to shipping sections by a variety of means.

For example: half a mile of railroad track, capable of accommodating 50 standard freight cars, enters the plant. Since tracks are in floor-depressed sidings, car and working floor levels are equal, making it convenient to move goods in or out of cars by means of pallets and industrial fork trucks.

There are also four enclosed truck wells capable of accommodating 22 trucks at one time. Electrically operated "dock lifters" raise or lower rear wheels of trucks so that tailboards are level with receiving docks.

Both railroad and truck entrances are equipped with roll-up electrically-operated doors, and unit heaters in these locations automatically go into operation when doors are opened, thereby counteracting blasts of cold air that normally would enter the plant when doors are opened to permit cars or trucks to move into or out of the factory.

Serving the high-bay sections are seven electric cranes, ranging in capacity from 50 to 15 tons. Crane spans measure 100 feet, and cranes are operated by eddy current ac clutches that enable operators to move equipment with the precision of a watchmaker.

Electric conveyors are used extensively for assembly work, and to move painted parts through a 165-kw infrared baking oven. Finished truck fenders are carried by overhead chain drags toward shipping areas faster than a man can walk.

Scrap from sheet metal operations drops through chutes to an underfloor conveyor extending from front to rear of the factory. This metal is automatically carried to a hydraulic press where it is compressed into 450-pound bales then, by means of a second conveyor line, is automatically transferred to waiting freight cars. Cuttings and chips of production are also removed by pneumatic tubes.

Electrical Services for Employees

Electrical equipment is also used extensively to provide conveniences, safety and service to employees.

An all-electric kitchen includes equipment for preparing, refrigerating, cooking and serving food, as well as continuous-belt dishwashers to handle tableware of 5000 diners daily.

A modern hospital includes X-ray and hydro-therapy equipment, as well as a fully-equipped operating room for emergency use, sterilizers, high-level illumination and electrostatic air filters.

Ventilation in the plant is provided by 270 fans, each moving 20,000 cubic feet of air per minute, while 141 thermostatically-controlled unit electric heaters maintain constant temperature comfort through the winter months. Winter supply units are operated through plug-in breakers on 480-volt busducts, while damper motors operate at 110-volts, power being provided by air-cooled 480/120-volt transformers. Control is through magnetic relays activated by outdoor thermo bulbs, indoor thermostats or manual pushbuttons, all connected to 480/24-v dry transformers.

MERCURY LIGHTING for high bays is provided by 3-kw single-phase fixtures connected to alternate phases of the lighting distribution system through single-lamp dry-type transformers mounted on vertical truss members.

NIGHT VIEW shows flood-lighted facade of office section of plant, and also reveals high-level pavement brightness obtained from asymmetrical street-lighting luminaires.

MAINTAINED ILLUMINATION in the order of 50-footcandles provides striking study in contrasts after dark. This section of the plant is lighted by 4-lamp 100-watt 267-volt fluorescent units supported by messenger cables.

High-Bay Mercury Lighting

HIGH-BAY areas are illuminated primarily by 450 mercury-vapor units equipped with 3-kw A-H9 lamps (120,000 initial lumens) operating at 535 volts and 6.1 amps provided by dry-type air-cooled transformers plugged into 400-a 460-v 3-phase lighting busducts. These units are single-phase fixtures, connected to alternate phases for proper balancing of loads through single lamp transformers mounted on vertical truss members. Connections between lamps and transformers are via AVA wire having 1000-v insulation, and both fixtures and lamps are grounded to the conduit system.

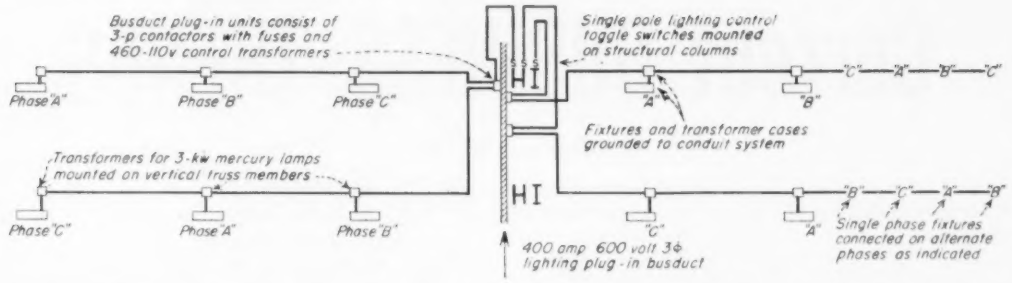
The plug-in units consist of 3-pole contactors with 60-a fuse clips and 460/110-volt control transformers. Control switches are located in column-mounted cabinets positioned 5 feet above the working floor.

In these same high-bay areas, an additional 150 fixtures are installed, lamped with 1000-watt filament bulbs. Like the mercury fixtures, they are controlled from column-mounted single-pole toggle switches connected through 110-volt control transformers to fused plug-in units in the 460-volt busduct lines. Each plug-in device serves three 30-amp fused safety switches and, through them, three 10-kva air-cooled 460-115/230-volt single-phase transformers. Eight 1000-watt lamps are connected to each transformer through a 50-amp circuit breaker.

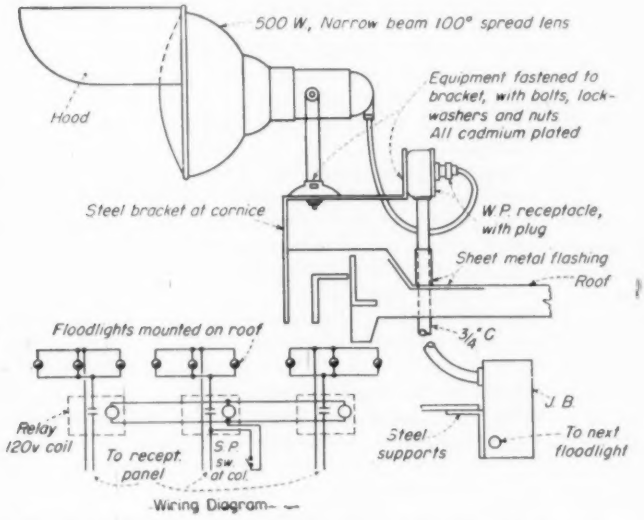
By combining the blue-white of the mercury units with the yellow-white of the filament lamps, suitable color correction is obtained, and the filament lamps provide instant illumination during those periods when mercury lamps are slowly coming up to full brightness after an inoperative period.

Maintenance of these high-bay fixtures is performed from special working platforms erected on top of the travelling cranes, and the possibility of falling lamps is precluded through the installation of wire-mesh baskets beneath each fixture.

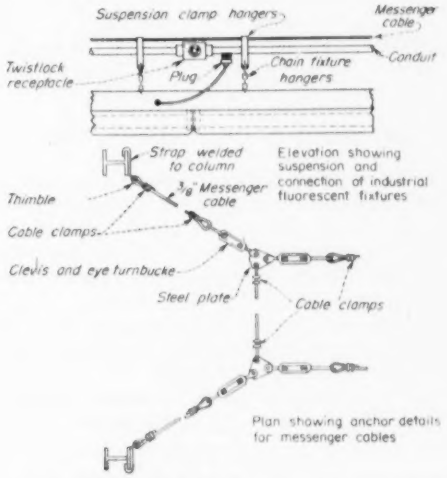
Mounting heights in the several high-bay areas are 33 and 45 feet. Il-


Busduct plug-in units consist of 3-p contactors with fuses and 460-110v control transformers
Single pole lighting control toggle switches mounted on structural columns
Phase "A"
Phase "B"
Phase "C"
"C" "A" "B" "C"
"A"
"B"
Fixtures and transformer cases grounded to conduit system
Transformers for 3-kw mercury lamps mounted on vertical truss members
HI
"B" "C" "A" "B"
Phase "C"
Phase "A"
Phase "B"
"C"
"A"
Single phase fixtures connected on alternate phases as indicated
400 amp 600 volt 3φ lighting plug-in busduct

MERCURY FIXTURES in high bay areas are operated in groups of six through separate transformers and fused plug-in contactor units equipped with 110-volt control take-offs. Fixtures are rotated between phases.



FLUORESCENT UNITS are mounted end-to-end in manufacturing areas, supported by messenger cables and chain hangers. Twistlock plugs and receptacles facilitate easy removal of fixture for maintenance. Messenger cables are secured at both ends by multi-leg anchors.



ROOF-MOUNTED FLOODLIGHTS are positioned along cornices of buildings and are controlled in groups of three by contactor relays remotely activated from receptionist desk in office foyer.

lumination intensities vary from 48 to 60 footcandles.

Messenger Cable Suspension

Lighting in manufacturing sections is provided by 4500 RLM enameled-reflector 4-lamp 100-watt 267-volt fluorescent units supported—together with their associated branch circuit conduit system—by stranded galvanized steel messenger cables. Cables are secured at both ends of all runs by turnbuckles and multi-leg anchors welded to structural columns, and are intermediately supported every 8 feet by rod hangers secured to roof purlins. Lighting fixtures and conduits are suspended from these cables by short chain hangers, while fixtures are connected to branch circuits through short flexible connections and twist-lock receptacles incorporated at intervals along each conduit run.

Control panels are of safety dead-front construction with double solderless lugs on the mains for 3-phase 4-wire solid-neutral connection. Breakers are single-pole toggles having inverse time characteristics to preclude unnecessary tripping under conditions of any momentary overload, yet thermal-magnetic trip elements will interrupt any excessive or prolonged overload on the circuit.

Lensed Troffers

Office lighting is provided by 2-lamp 40-watt troffers equipped with Holophane lenses. Troffers are set flush with acoustical ceilings, supported by snap-in tee-bar block frames. Office lighting (plus kitchen equipment) is served through 440-120/208-volt three-phase transformers.

Exit lights in all parts of the plant are separately circuited, wired to upper breakers (locked in the "on" positions) in control panels. Illumination outside the plant is provided by 500-watt narrow-beam hooded floodlights mounted along roof cornices, series-wired ornamental street-lighting units, wide-beam floodlights to dramatically highlight the attractive facade of the office section, and 100-w obstruction lights plus a 1000-w aircraft beacon light atop the plant's water tower.

Roof-mounted floodlights are controlled in groups of three by contactor relays remotely operated from the receptionist desk in the main office lobby. Lights are connected to waterproof receptacles by flexible leads, while conduits from receptacles pierce the roof through sheet-metal flashings.

The beacon and obstruction lights are turned on at sundown and turned off at sunrise through the action of a photo-cell incident-light activator.

McGraw-Hill Economists Look at

Current BUSINESS TRENDS

by Dexter M. Keezer

Is the economy taking off on another great wave of price inflation?

This question has been tossed at us with mounting frequency as wage and price increases have continued to spread during the past month. To give added point to the question the federal government continues to run a deficit which might help accommodate, if not itself produce, more inflation.

If the government finances its deficit by borrowing from banks, new money or its equivalent in credit is created without any compensating increases in goods and services. Hence, more money, without more goods. That's a financial foundation of price inflation.

Our answer to the question is "No."

Unless some desperate new international crisis touches off another mass stampede to buy before war requirements make it too late—a quite remote possibility at this juncture, it seems to us—we do not anticipate much of any increase in the general level of prices over the period immediately ahead, say the next year. *For the long pull we think the general trend of prices will be upward, but we still anticipate some let-down in business before they get firmly headed that way again.*

The principal foundations for our feeling that another wave of price inflation is not at hand are these:

1. Although impressively numerous, industrial wage and price increases posted in recent months have been of relatively modest magnitude.
2. Unless the drought now devastating a large part of the Southwest becomes more general, farm prices can be expected to drift downward. Latest reports indicate above average crops for the nation as a whole.
3. The federal deficit in prospect for the coming year will have a relatively mild inflationary potential. The increase in total money supply will not be much more than in the past year.
4. While continuing to buy at a very handsome rate, consumers are not buying and show no signs of buying in that hectic way which, on the demand side, is required to create an alarming wave of inflation.

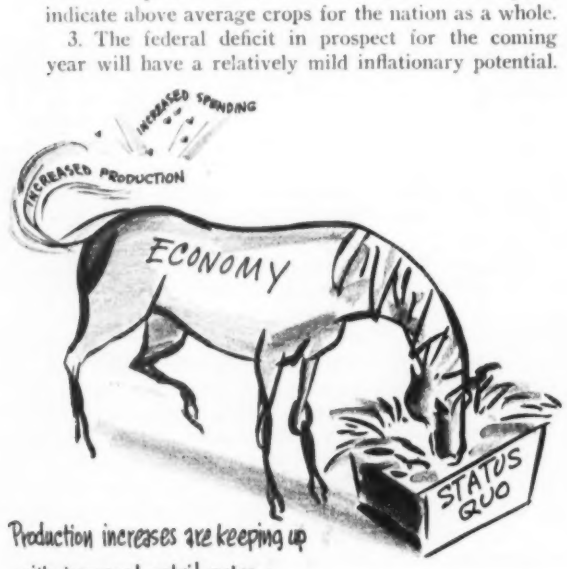
As it takes two to tango, so it takes two major elements to inflate the general level of prices. One is a supply of money or its equivalent in credit that is increasing faster than the supply of goods. The other is such an acute eagerness on the part of buyers to get the goods available that they rush to the markets to spend the increasing supply of money.

In the thirties the federal government pumped money into the economy at a high rate in trying to get the price level moving up again. But it didn't work because people didn't believe one of the few catchy songs of that dismal time that "Now's the time to buy."

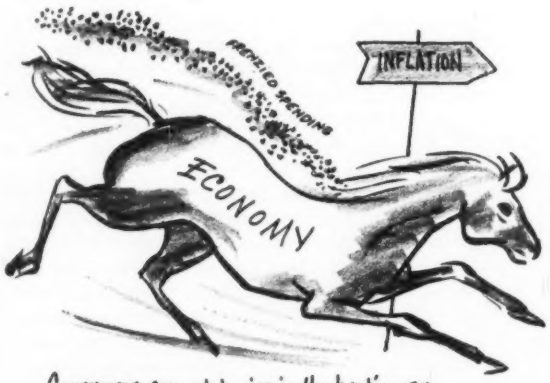
Right now people generally do think it's a good time to buy, as attested by the retail sales figures, which are running 5% to 10% ahead of last year. But they are going about their buying with none of the frenzy which creates violent waves of inflation. A basic reason, of course, is that—far from seeing shortages ahead—they see production moving forward at record breaking peace-time levels.

Under such circumstances basic price increases are likely to be absorbed somewhere along the line before they are passed on to consumers. In fact, the price increases which have occurred are highly selective and specialized. There has been no talk of raising automobile prices. Machinery prices are up very little. Many soft goods prices are weak, not strong. The most important instances of price raising are steel, oil and (still a rumor at this date) electric appliances. All three cases reflect special circumstances:

Steel prices went up $4 a ton. But they are only up about $9.20 a ton since early 1951, compared to an increase in



Production increases are keeping up with increased retail sales



Consumers are not buying in the hectic way required to create an alarming wave of price inflation

The manufacturer seems to be raising his prices and hoping the distributor will absorb any squeeze that results from consumer resistance

steelmakng costs of $10 to $15 a ton. The latest action appears to be a belated effort on the part of the steel companies to get base prices in line with costs before volume begins to drop off. Steel demand is not very sensitive to price changes. So it makes sense to maintain profit margins. But extra charges made for special steels will probably be reduced when competition gets keener. Fabricators will use less conversion steel, and less steel shipped from distant points. So the net cost increase will not be as great as indicated by base prices. And very little will be passed on by steel fabricators.

Crude oil prices had not been increased since 1947. As in the case of steel, crude oil producers evidently want to get the margin between prices and greatly increased costs back to a normal relationship. It is much more questionable whether all the increases announced in prices of refined petroleum products can be made to stick. We're at the seasonal peak for gasoline demand now. When this slacks off, new price wars are likely. And even if gasoline prices hold, a drop in the price of residual fuel oil seems sure. Production and imports are increasing, while industrial demand has begun to drop.

Thus the average price of refined products may remain at or below recent levels. Traditionally, the big profits in the oil business are made on crude. A squeeze on refiners between higher crude prices and stable or falling retail prices would be nothing new.

Electric appliances just don't sell at list price any more, at least not in the big cities. Retail price wars are spreading, with 20% to 30% discounts the usual thing. In these circumstances, General Electric's announcement that it would raise list prices for some appliances would appear to have limited significance. Other makers seem reluctant to follow suit. (GE has often gone against the general trend in the appliance business.) And retailers are even less likely to raise prices to their customers.

In all three cases, the manufacturer seems to be raising his prices and hoping that the distributor will absorb any squeeze that results from consumer resistance. This was often the case before World War II when profit margins in wholesaling and retailing were much lower than they have been in recent years. There is some reason to doubt that distributors will quietly revert to their former unenviable position. But in any case, a realignment of prices and margins between manufacturers and distributors is not the same thing as general inflation.

There are those who argue that, even if there is nothing in the latest wage-price developments to cause inflation, a large increase in federal deficit financing is sure to do so. *Recent estimates are that the Treasury will have to borrow about $10 billion in the second half of 1953 to pay its bills.* As much as $4 billion might be obtained from corporations, which buy short-term government securities as a reserve against their income tax liabilities. But the other $6 billion will probably have to come from commercial banks—which means the money will just be created by crediting the government's account. The drop in reserve requirements announced by the Federal Reserve on June 24 will permit (by no coincidence) about $6 billion of new credit.

The banks will probably have to pump another $5 billion into the money supply in the form of seasonal loans to business for fall inventory, additional consumer credit and some purchases of state and local securities. In other words, we may have over $10 billion of new money flowing into the economy in the form of bank credit—which looks inflationary enough at first glance.

But on closer inspection, this figure is not so imposing. It's only a little more than last year's rise in the money supply, which failed to cause any uptrend in prices. And $10 billion would be only about 5% increase in the present supply of money. The output of goods and services (gross national product, not adjusted for seasonal) could easily increase that much by the end of 1953. That leaves no reason to expect a surplus of money that will force up the price of goods.

In fact, if government expenditures or business expansion turn out to be less than assumed above (the end of the Korean War, for example, would save at least $1 billion), the supply of goods may well outrun the increase in money to buy them. So it is at least an even bet that prices will be falling, not rising, before 1953 is over.

This underlines the difficulty of the problem facing the federal fiscal authorities and their associates on the Federal Reserve Board. Their stated objective is to regulate the money supply to an amount which is about in balance with the supply of goods, and so avoid either inflation or deflation. The objective is commendable; but in actual operation it becomes extremely difficult to achieve. Somehow, the balance is likely to get upset. And the economy will start moving either up or down. Having ruled out inflation, *we are sticking with our opinion that the drift is likely to be downward.*

Last year's rise in the money supply failed to cause any uptrend in prices

Conductors in Multiple

Advantages include greater current-carrying capacities, availability, flexibility, installation ease and dollar savings. Here are some reasons and suggestions for their use, based on the 1953 edition of the NEC.

By Carroll A. Badeau Chief Engineer, The Thomas & Betts Co., Inc., Elizabeth, New Jersey

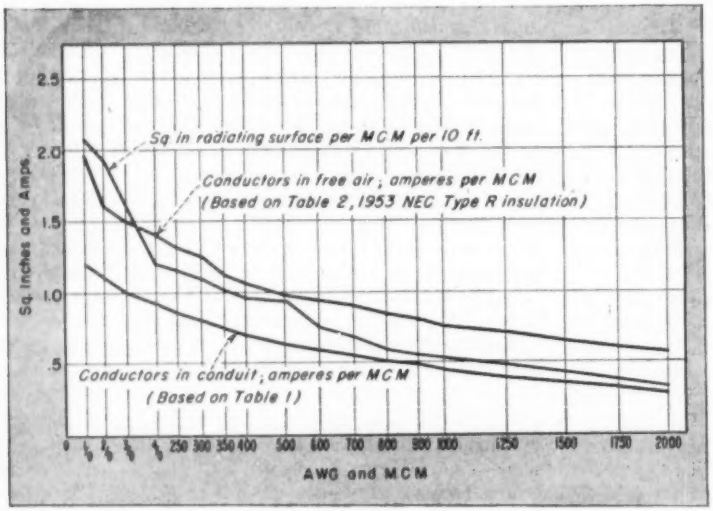

Sq. Inches and Amps.
2.5
2.0
1.5
1.0
.5
Sq in radiating surface per MCM per 10 ft.
Conductors in free air; amperes per MCM
(Based on Table 2, 1953 NEC Type R insulation)
Conductors in conduit; amperes per MCM
(Based on Table 1)
0 1/0 2/0 3/0 4/0 250 300 350 400 500 600 700 800 900 1000 1250 1500 1750 2000
AWG and MCM

FIG. 1—Chart shows amount of radiating surface and ampere ratings of cables varying in size, run in free air and in conduit.

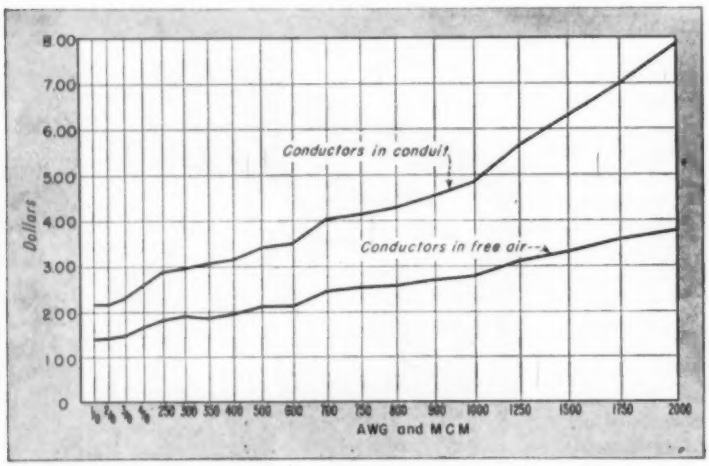


FIG. 2—Cost per ampere per 1000 feet (single conductor) increases with the size of cable, as indicated by tables contained in the 1953 NEC.

FOR a great many years, the National Electrical Code has recognized the use of conductors run in multiple, but has required special permission for each installation. Uses and advantages of multiple conductors are now becoming so generally known, however, that the 1953 edition of the Code provides for the general use of multiple conductors, and contains detailed rules and ways for computing equivalent runs.

It is obviously more difficult to set up an electrically balanced circuit containing two or more conductors per leg, than it is to use single conductors per leg. Therefore, there must be some powerful advantages to be gained—and there are.

The whole theory of running conductors in multiple is based upon the fact that a smaller conductor will carry more current per circular mil than a large conductor. Why? Because code current ratings are primarily based on temperature rise, and smaller cables have a greater radiating surface per circular mil than do larger cables (Fig. 1). Note that the larger the cable size, the less radiating surface is available per circular mil.

In addition to temperature rise, another factor is the skin effect loss which is quite appreciable on larger conductors, those over 500 MCM. As Code ratings are based primarily upon temperature rise, the ampere ratings per circular mil are greater for smaller conductors. Note (Fig. 1) that a 1000 MCM cable in conduit is rated at about half the ampere per MCM as for a 250 MCM cable.

Another factor that makes smaller cables more attractive than larger cables is that of cost. (Fig. 2) Note that the larger the cable, the greater

Single Cable Size MCM	Equivalent Cables in Multiple Per Lug								
	2			3			4		
	R	RH	V	R	RH	V	R	RH	V
4/0	1/0	1/0	1/0						
250	2/0	2/0	2/0						
300	3/0	3/0	3/0			Economical			
350	3/0	3/0	3/0						
400	4/0	4/0	4/0	1/0	1/0	1/0			
500	250	250	250	2/0	2/0	2/0	1/0	1/0	1/0
600	300	300	300	3/0	2/0	3/0	1/0	1/0	2/0
700	350	350	350	3/0	3/0	3/0	2/0	2/0	2/0
750	350	350	350	4/0	4/0	3/0	2/0	2/0	2/0
800	350	350	350	4/0	4/0	4/0	3/0	2/0	2/0
900	400	400	400	4/0	4/0	4/0	3/0	3/0	3/0
1000	500	500	500	4/0	4/0	250	3/0	3/0	3/0
1250	500	500	500	250	250	250	4/0	4/0	4/0
1500				300	300	300	4/0	4/0	250
1750				300	300	350	4/0	250	250
2000	Uneconomical			300	300	350	250	250	300

FIG. 3—A single conductor may be replaced by 2, 3 or 4 smaller conductors per leg, with dollar savings ranging from 20- to 100-percent. This chart considers conductors run in free air.

Single Cable Size MCM	Equivalent Cables in Multiple 2 per Lug		
	R	RH	V
4/0			
250	1/0	1/0	
300	2/0	2/0	
350	3/0	3/0	
400	3/0	3/0	
500	4/0	4/0	
600	250	250	
700	300	300	
750	300	300	
800	300	300	
900	350	350	
1000	350	400	
1250	500	500	
1500	500	500	
1750	500	500	
2000	500	500	

FIG. 5—Three-wire circuits in conduit can be formed with either 1, 2 or 3 cables per leg. Here, again, comparison favors smaller conductors.

Single Cable Size MCM	Equivalent Conductors in Multiple Per Lug								
	2			3			4		
	R	RH	V	R	RH	V	R	RH	V
300	1/0	1/0	1/0						
350	2/0	2/0	2/0						
400	3/0	3/0	3/0			Economical			
500	3/0	3/0	3/0			1/0			
600	4/0	4/0	4/0	1/0	1/0	2/0			
700	250	250	250	2/0	2/0	2/0			
750	250	250	250	2/0	2/0	2/0			
800	250	300	300	3/0	3/0	3/0			
900	300	300	300	3/0	3/0	3/0		1/0	1/0
1000	350	350	350	3/0	4/0	4/0	1/0	2/0	2/0
1250	400	400	400	4/0	4/0	4/0	2/0	3/0	2/0
1500	500	500	500	250	250	250	3/0	3/0	3/0
1750				300	300	300	4/0	4/0	4/0
2000				350	350	350	4/0	4/0	4/0
	Uneconomical								

FIG. 4—A 2-conductor circuit, run in conduit, may consist of 1, 2, 3 or 4 cables per leg. Economies are obtainable by using multiple cables in the smaller sizes.

Single Cable Size MCM	Equivalent Cables in Multiple Per Lug					
	2			3		
	R	RH	V	R	RH	V
4/0	1/0	1/0	1/0			
250	2/0	2/0	2/0	Economical		
300	3/0	3/0	3/0			
350	3/0	3/0	3/0	1/0	1/0	1/0
400	4/0	4/0	4/0	2/0	2/0	2/0
500	250	250	250	3/0	3/0	3/0
600	300	300	300	4/0	3/0	4/0
700	350	350	350	4/0	4/0	4/0
750	350	350	350	4/0	4/0	250
800	350	350	350	250	250	250
900	400	400	400	250	250	250
1000	500	500	500	300	300	300
1250	500	500	500	300	300	350
1500				350	350	400
1750	Uneconomical			350	350	400
2000				400	400	500

FIG. 6—Due to code limitations of 9 conductors in a conduit, a 4-wire circuit cannot have more than 2 cables per leg, yet savings are still possible.

the cost per ampere rating. This would indicate that the smaller or middle size cables are more economical than the larger size cables. Prices used for this tabulation are current selling prices for Type RH building cable.

Another factor is that the smaller size cables are more available than the larger cables. Typical electrical wholesalers commonly stock cable sizes through 500 MCM, some going to 1000 MCM. Larger sizes are generally made to order.

Consider also that smaller cables are much more flexible and lighter and are, therefore, easier to fish in conduit than the equivalent capacity in large cable.

In addition to savings in cable, certain combinations of conductors in multiple also result in smaller conduit. This, plus smaller fittings represents a considerable dollar saving. It is understood that 4 inch and smaller conduit is normally stocked, larger sizes coming from the mill.

Fig. 3 shows the sizes of conductors run two or three in multiple per leg that are equivalent to one larger wire per leg. This chart is based on ratings for conductors in free air, of R, RH and V types of insulation. Evaluating these multiple runs in dollars per foot of combined conductors per leg yields some interesting comparisons. The same dollar spent for smaller conductors run in multiple yields 20 to 100% more current carrying capacity!

Considering conduit runs, Fig. 4 is

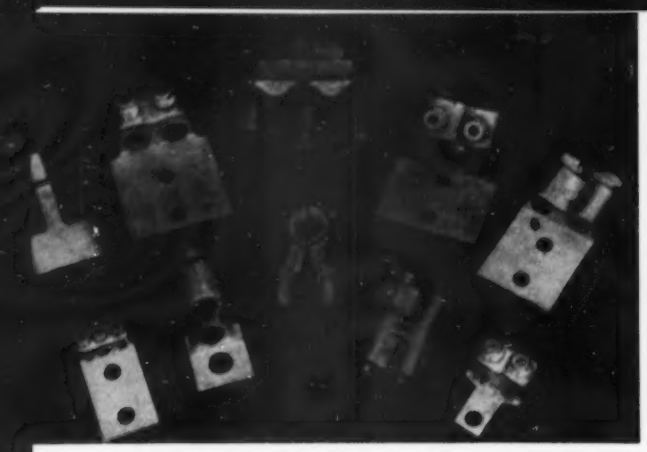


FIG. 7—Multiple cable terminal connections may be secured in a wide variety of styles, each lug designed for specific applications and containing special features.

FIG. 8—Junction point between cables and bus bars indicates use of 2-wire connections, joining 350 MCM cables to 400-amp busduct.

based on ratings for conductors in conduit, two-wire circuit. Similar economies are shown.

Fig. 5 shows a similar tabulation for three-wire circuits.

A four-wire circuit in conduit can be similarly analyzed, as Fig. 6 shows. But, because of the nine conductor limitation in conduit, no more than two conductors can be used in each leg.

These charts cover the allowable range of multiple conductor sizes 1/0 through 500. However, it is recommended that preference be given to using conductor sizes 1/0 through 4/0 in multiple as being more economical than larger sizes in multiple, and that preference be given to using two or three conductors in multiple rather than four, as being generally more economical and simplifying the connection problem.

Paragraph 3105 of the 1953 National Electrical Code concisely states the requirements:

Paragraph 3105. Conductors in sizes 1/0 to 500,000 circular-mil inclusive, may be run in multiple provided they are of the same length and have the same circular-mil area and type of insulation. Where conductors are run in multiple, they shall be arranged and terminate at both ends in such a manner as to insure equal division of the total current between all conductors that are involved.

When conductors are used in multiple, space in enclosures should be given consideration.

The Canadian Electrical Code, Part I, Sixth Edition, Paragraph 12-030 covers similar requirements:

Paragraph 12-030. Conductors of similar conductivity in sizes of #1/0 B&S size and upwards may be run in multiple provided they are:

a. Free of splices.
b. The same circular-mil area.
c. The same type of insulation.
d. The same length.
e. Terminated at both ends in such a manner as to insure equal division of the total current between the conductors.

It should be noted that the current ratings which are used in all tabulations in this article are based upon temperature rise only. It is obvious that voltage drop must often be considered and that running the same amount of copper in multiple does not reduce the voltage drop.

When making a multiple conductor installation, it would be advisable to check the operating temperature after the circuit is energized to be sure that each conductor is running at approximately the same temperature and, therefore, at equal load. The terminations should be of identical resistance. This would indicate that special terminations may, in some cases, be needed. It is possible to readily secure multiple terminal connections (Fig. 7). These are of two, three, and four wire design, and as each of the multiple connections is identical in design and material, the only additional precaution is to install them with the same tightening force.

FIG. 9—Triple conductor installation for electro-plating application uses three 500 MCM cables with combined rating of 1545 amps.

Fig. 8 shows the use of multiple conductors at a junction point of conduit and bus duct. The conductors are 350 MCM in four inch conduit having a rating of 416 amperes feeding a 400 ampere bus duct. Had single conductors been used, this installation would have required three 750 MCM conductors with a rating of 400 amperes in 3½ inch conduit.

Fig. 9 shows a triple conductor installation supplying low-voltage current to an electro-plating barrel. These conductors are each 500 MCM with a combined rating of 1545 amperes, which rating was impossible to attain with standard single conductors, the highest rating on 2000 MCM being 1155 amperes. Note that while three of the terminals are of special triple barrel design, the fourth connection was made using three standard single barrel lugs bolted to a copper bus on the barrel tank.

In conclusion, the disadvantage of conductors in multiple is that care must be exercised to be sure that each conductor in multiple carries its equal share of the load. The advantages are that by using cables 500 MCM and smaller, any practical circuit can be wired up, using less copper at lower cost with smaller conduit with greater ease of installation than with single large conductors.

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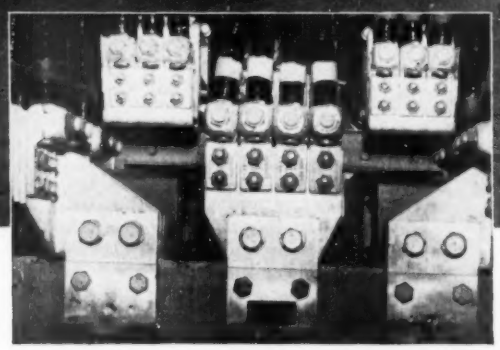

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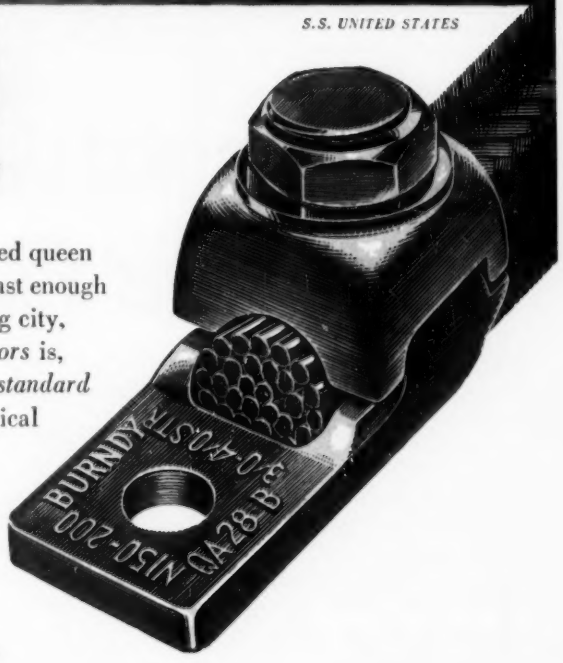

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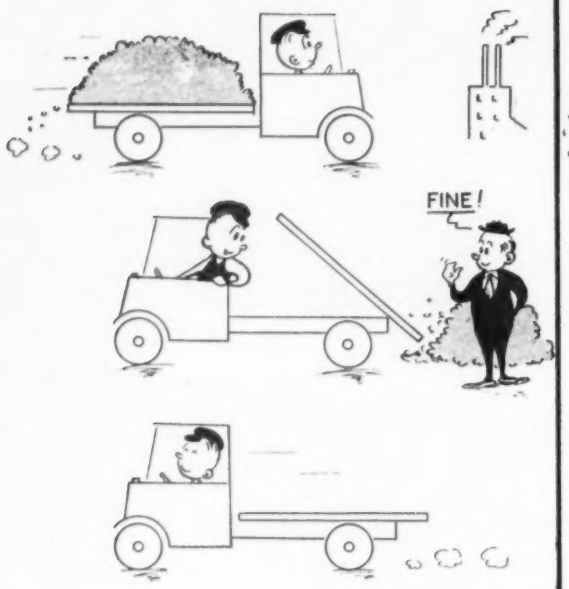
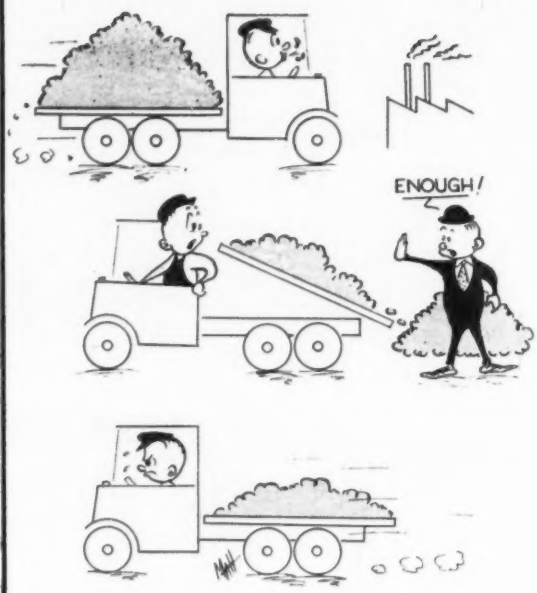


PLANT WITH HIGH POWER FACTOR can be likened to customer ordering just enough coal to meet his requirements. Since his **demand** closely matches his actual **energy consumption,** the coal dealer need not invest in oversized equipment to transport a demand which is not justified. With reduced overhead, the dealer can afford to give the customer a good price on the delivery.



PLANT WITH POOR P-F is like the fellow who demands ten tons of coal when he only requires seven. Not only does he tie up extra equipment that could be used elsewhere more profitably, but he forces the dealer to find some other outlet for the unrequired three tons. The dealer would be justified, therefore, in billing the customer not only for the needed **energy** but for the needless **demand** as well.

ELECTRIC CONSERVATION Through Power Factor Correction . . part 1

A discussion on the benefits of high p-f and on how this factor can be improved through the application of capacitors and synchronous motors.

By N. A. Maynard, *Westinghouse Electric Corporation, Boston, Mass.*

THE term *power factor* is used to express the proportion of *power* current to *total* current. The term may be used to express a momentary value or a long-period relationship. Utilities are generally concerned with pf at *peak* load, since this value determines their investment in required equipment to serve maximum loads in their area. However, in determining cost of service over a long period, *average* pf is more important since sizes of lines, transformers and generators are governed to a degree by heat generated while handling currents over a continuous or long-interval period.

Improving the pf of a system has numerous benefits. For example: Amount of copper required to carry a given load is reduced when the total current is reduced. Life of insulation is increased because of smaller copper losses and resultant lower temperatures. Feeder losses are lessened. Lamp life is lengthened due to improved voltage regulation. Total power and power *bills* are reduced by minimizing pf penalty rates. Required capacity of a generating plant is reduced and transformers are less subject to overloads. Voltage regulation is bettered. Improved motor voltage decreases slip, increases motor torque and efficiency. And, furthermore, added *load* is provided for without adding to *size* of the distribution system.

Since *total* current is reduced as pf improves, and since feeder sizes are

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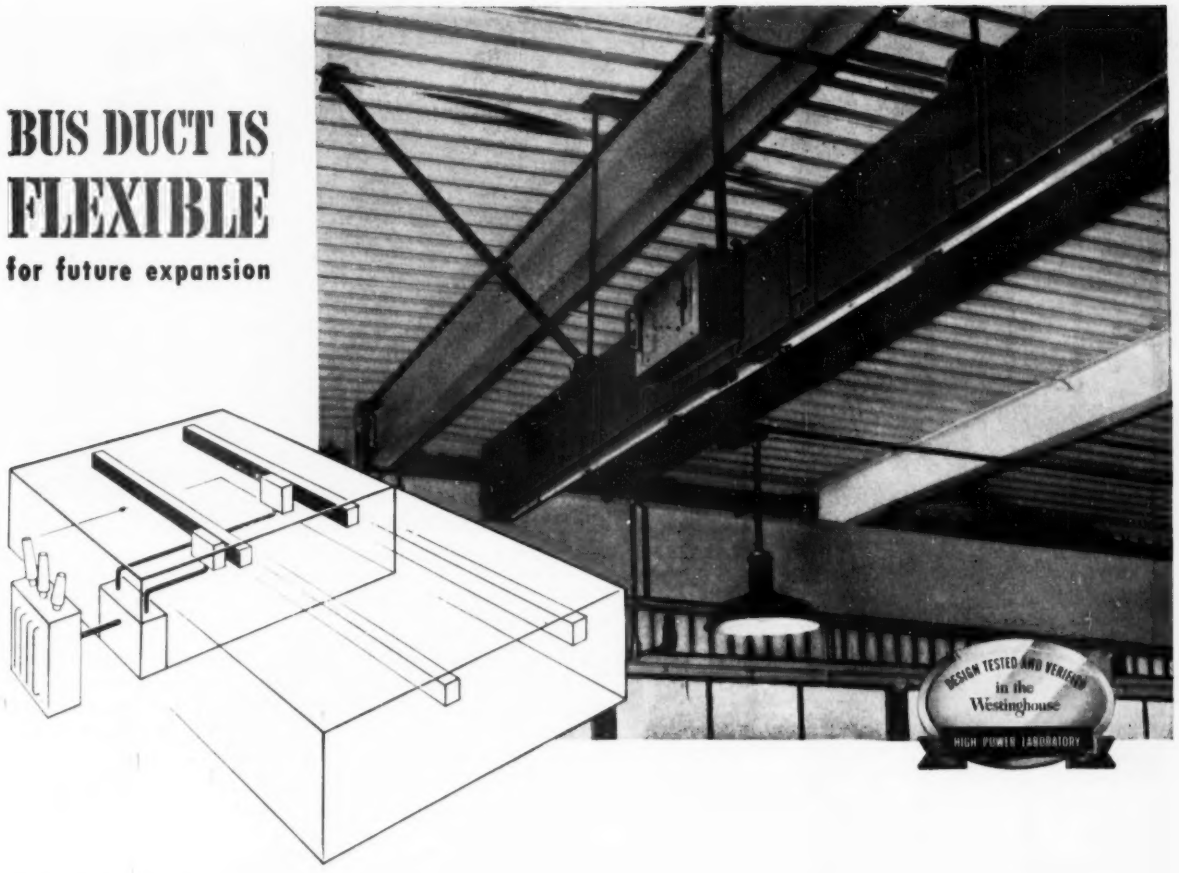

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LARGE SHUNT CAPACITOR BANK is installed for machine shop having 2300-volt 25-cycle primary power supply. The installation improved the voltage regulation; also raised the power factor which had been initially low due to intermittent operation of welders and machine tools.

dictated by the total kva carried, improving the pf results in smaller cables required for a given load. Or, stated in a different way, a greater load may be carried without increasing the size of feeders. This reduction in the amount of copper is a direct economic dividend.

A higher pf generally results in a lower power bill. In fact, the average power bill is made up of several charges, one of which is known as a power factor charge. Since the wattless current that exists in the case of low power factor does not register on a kilowatt-hour meter, it is necessary for the power company to assess the user for it by means of a charge for low power factor. Wattless current must be generated and transmitted, even though it does no work, and it therefore ties up capacity that could otherwise be producing active power. And should demand be figured on a kva basis, as it sometimes is, rather than on the basis of kw, poor power factor will cause this charge to be higher than it would ordinarily be.

Power factor correction is reflected all the way back to the generator in the elimination of overheating in smaller generator coils, and in decreased field excitation required to overcome the demagnetizing effects of lagging currents.

For analysis let us consider a 2300-volt 1250-kva generator serving a 1000-kw load. With a 568.75-kva capacitor bank installed on the generator side of a step-down transformer, the pf is 90% lagging and the amperage is 290. Without capacitors the pf is 66% lagging and the current is 360 amps. The use of capacitors corrects the pf from a very low value and can easily be justified. In general, it can be said that capacitors should be installed if the pf is less than 90% or 95%. Above that point power equipment such as synchronous motors as well as capacitors should be added.

Savings associated with operation of motors at high pf are also numerous, since poor power factors result in low system voltage and can thus cause sluggish motors, burnouts, reduced efficiencies, decreased starting speeds, lessened torques, increased slippage and greater heat in the windings.

How Is PF Improved?

Power factor may be improved through the use of capacitors, synchronous motors, or a combination of the two, to supply the reactive volt-amperes needed by such equipment as induction motors, welding transformers, etc.

Capacitors can be located anywhere. They can be placed right at the cause of the low power factor—right at a motor or group of motors, on branch circuits or on small feeders. In this way, the benefits of improved power factor are extended all the way back through the distribution system, transformers, transmission lines and generators. Or they can be placed at the primary or secondary of the transformer, or at a power center that serves a group of loads that require reactive volt amperes.

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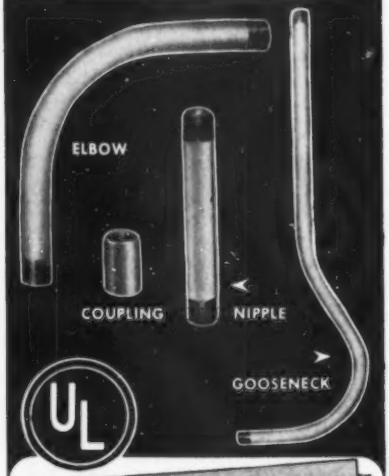

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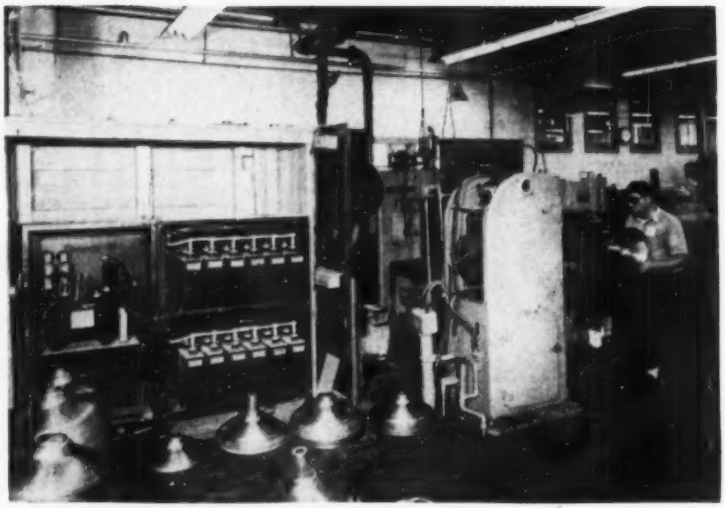


TWELVE 75-MFD CAPACITORS, together with a discharge resistor and overload protection, are used in this reflector manufacturing plant to bring p-f of 75-kva spot welder nearly up to unity. Related benefits are improved quality of welds, reduced light flicker, prolonged lamp life and decreased power charges.

sets (100-hp and over), compressor drives (air, gas, refrigeration), vacuum pumps (reciprocating and rotating), paper mill Jordan engines, line shafting where a large motor is started infrequently, rubber mill drives, metal rolling mills and fans.

The use of synchronous motors for the larger drives should always be considered in such cases. Since they obtain their excitation from separate exciters which may be easily controlled, it is possible to create either a leading or lagging current on the line as desired. By using synchronous motors properly with respect to ratings, the lagging current drawn by induction motors and similar inductive devices can be counter-balanced. In this sense, synchronous motors can justly be classified as pf corrective devices.

Other factors to be considered in the selection of a synchronous motor are motor efficiency, power factor, starting and pull-in torques, available floor space, variations in load and voltage, and limitations in the electrical voltage system.

What Is The Best Method?

To answer the question of which method to use for correction of pf, a thorough study of the problem is recommended. Data should be compiled concerning *what* is to be corrected, how *far* correction is to be carried and *reasons* prompting the decision to obtain this correction. Reasons might include savings in power bills, an increase in the capacity of a distribution system, release of generator capacity or any combination of these objectives.

Knowledge is also required of the type of drives involved, utility rate structures, amount of power purchased and amount of power generated. It is also pertinent to know whether the installation to be corrected is proposed or is already in existence.

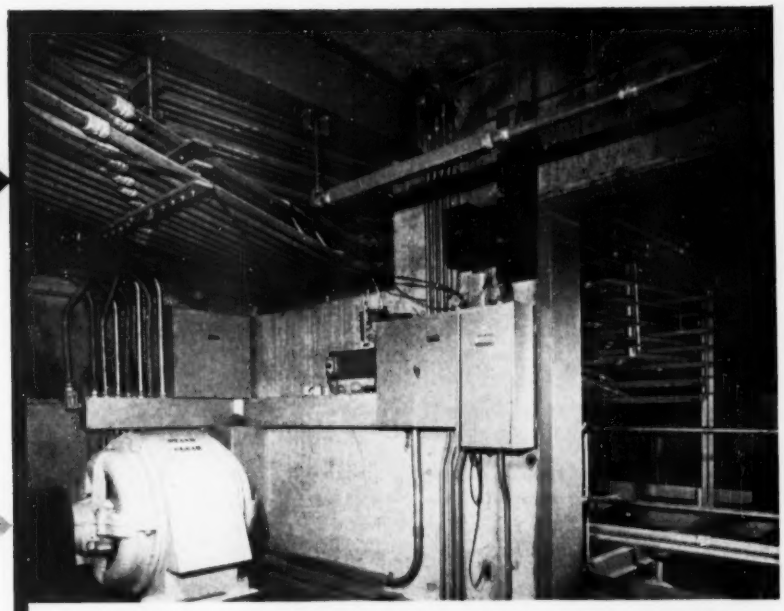
These questions must be studied by the plant engineer, but it is well to check the answers with application engineers employed by various apparatus manufacturers. In this way you will be assured of your expected investment return, and will have the benefit of specialized experience as to the most practical method of pf correction.

In connection with high pf, it should be remembered that induction motors should operate at a high percentage of full load; that is, drives should not be "overmotored". Also, applied voltage should be kept close to nameplate value. High-speed motors are usually preferred since they have better pf possibilities and, in addition, are generally smaller and cheaper. In this connection, gearmotors with these characteristics are now available.

Initial cost of the equipment and kvar generated are not the *only* considerations that influence the choice between synchronous motors and capacitors, and consideration should also be given to (1) relative efficiencies of capacitors compared to synchronous motors, (2) complexity of synchronous motor control compared to induction motor control for the same application, (3) space available for a synchronous motor with its exciter compared to an induction motor, and (4) comparative maintenance of a synchronous motor with its collector rings, brushes and

what a difference

what a saving



...with COPE CABLE TROUGH

SEEING IS BELIEVING! Here you can see at a glance the time, material and labor savings possible on cable installations through the use of Cope Cable Trough. Both of these photographs were taken at the City of Glendale (California) generating plant. The upper and older installation shows 126 - 1¼" conduits containing cables for controlling the auxiliaries for two turbine generators. Just look at the tremendous number of bends and fittings, and the complicated hanger construction needed to support this maze of conduit. You can imagine the high cost of engineering, material, and installation this entailed, even before the big job of pulling cable through the conduits was possible.

Now examine the lower, recent installation (view taken during construction) involving control of two additional generators, where cables for control conduits 480 volt auxiliary power, and 2400 volt auxiliary power are carried in Cope Cable Trough. It was a simple job to lay out and erect this trough using standard lengths and fittings. Costs were but a fraction of the older method; time and material were saved and accessibility for visual cable inspection is provided. Additional cables may be added with great ease.

You, too, can make such savings.

T.J. Cope INC.

A detailed bulletin giving all the facts about Cope Cable Trough will be sent upon request. Write for it.

You know Cope by these products

711 SOUTH 50th ST. • PHILADELPHIA 43 • PA.

anchoring problems?

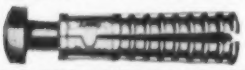
then try

TRADE ARRO MARK

anchoring & fastening devices

More and More, people with anchoring problems are turning to ARRO — the complete line of anchoring and drilling devices for masonry. Remember, there is an ARRO product to meet your specific anchoring requirements.

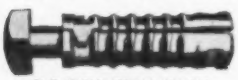
ARROFLUTE CARBIDE MASONRY DRILL



LAG SCREW EXPANSION SHIELD

A-C-E EXPANSION SHIELD

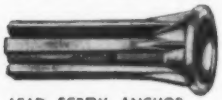
DOUBLE EXPANSION SHIELD



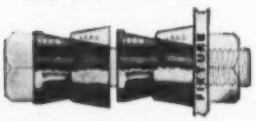
O-E EXPANSION SHIELD

MACHINE SCREW ANCHOR

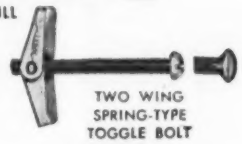
STUD BOLT ANCHOR



LEAD SCREW ANCHOR



MAL-LEAD BOLT ANCHOR



TWO WING SPRING-TYPE TOGGLE BOLT

SPRING HEAD STEEL TOGGLE BOLT

RIVETED HEAD TOGGLE BOLT

LITTLE MAJOR TURNBUCKLE

FOUR-POINT HAND STAR DRILL

THREE-POINT DRILL POINT

FOUR-POINT DRILL POINT

TWIST DRILL POINT

RUBBERGRIP DRILL POINT HOLDER

See your industrial, hardware or electrical supplier

ARRO EXPANSION BOLT COMPANY

1540 Boone Ave., Marion, Ohio

exciter compared to an induction motor.

Use of Synchronous Motors

Constant-speed characteristics of synchronous motors are advantageous in numerous applications, yet other important reasons recommend their use. In addition to constant speed and power factor correction, these include:

1) High-efficiency is inherent in synchronous motor design. Losses are lower than in induction motors where magnetizing current must be supplied from the ac line instead of from a separate dc source.

2) Over-all economy. Considering lower first cost, low maintenance expense and improvement of pf, synchronous motors for many types of drives are very desirable.

3) Minimum floor space. Many synchronous motor installations require less floor space than any type of drives.

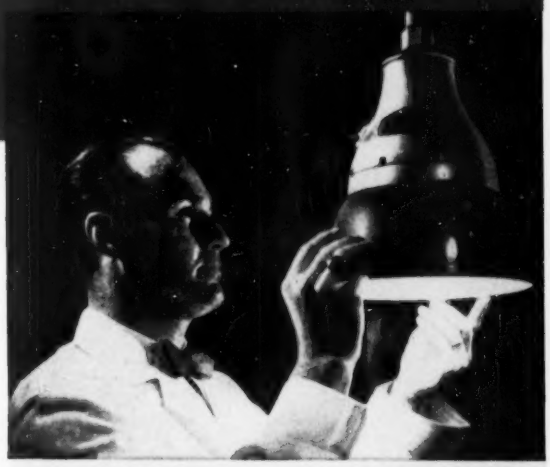
4) Direct-drive synchronous motors can be obtained for economical application to low speed, direct-coupled drives. They also can be applied as engine-type motors mounted directly on the shaft of the machine.

Capacitors, synchronous motors or a combination of the two installations can be justified on a cost basis alone. Yet they also provide better voltage regulation and improve line conditions generally. These are *bonus* benefits. For an economic analysis of this problem, read Part II of this article next month.

SPEAKERS on an interesting Light and Vision session of the IES East Central Regional Conference, held in Baltimore, Md. late in May were: James M. Ketch, General Electric Lamp Division, Nela Park; Willard Allphin, Sylvania Electric Products, Inc., Salem, Mass.; and Dr. Israel Dvorine, Baltimore ophthalmologist, shown receiving thanks from East Central Regional Vice President Paul H. Hildebrand, Pennsylvania Power and Light Co., Allentown, Pa.

Rigid testing of *Explosion-Proof* CONDULETS*

assures safety and long dependable service



Probing for maximum exterior operating temperature on a Type EVA Explosion-Proof Lighting Fixture using a multiple point recording potentiometer.

Crouse-Hinds extensive laboratories and modern manufacturing combine to give you top quality

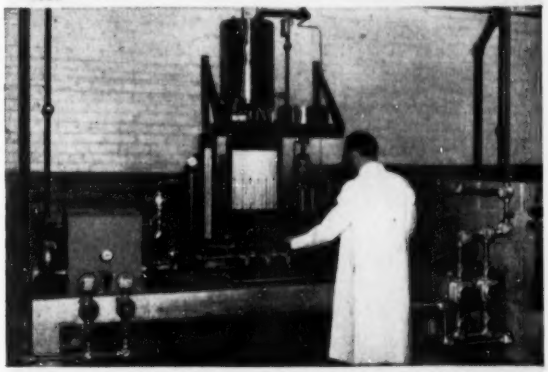
Laboratory testing is one of the key operations in the production of electrical equipment of the highest quality. Crouse-Hinds laboratories are equipped with the latest scientific instruments and staffed with expert technicians.

Products are constantly tested to make sure that they are being made to withstand field conditions. New devices are tested to predetermine their meeting or surpassing the requirements of Underwriters' Laboratories.

The photographs at the right show three of the many testing operations that are done in the Electrical Laboratory. It is equipped with apparatus for making both alternating and direct current tests, heat tests, pressure tests and many others.

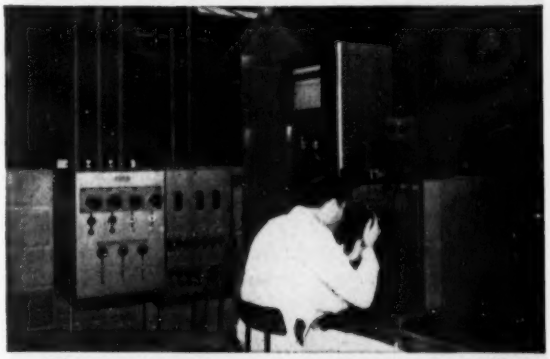
Close cooperation between Crouse-Hinds laboratories and manufacturing departments is one of the reasons why Condulets have been the "Standard of Quality" for nearly fifty years.

Specify CONDULETS on every job. They're made right ... to serve you better ... and last longer.



Adjusting carburetors and flow meters to create a predetermined explosive mixture within an explosion-proof Condulet for an explosion test.

When quality counts
... you can count on Condulets



Photographing the pressure wave in the Oscilloscope to determine the maximum explosion pressure within an explosion-proof Condulet that is behind the concrete wall.

CROUSE-HINDS COMPANY
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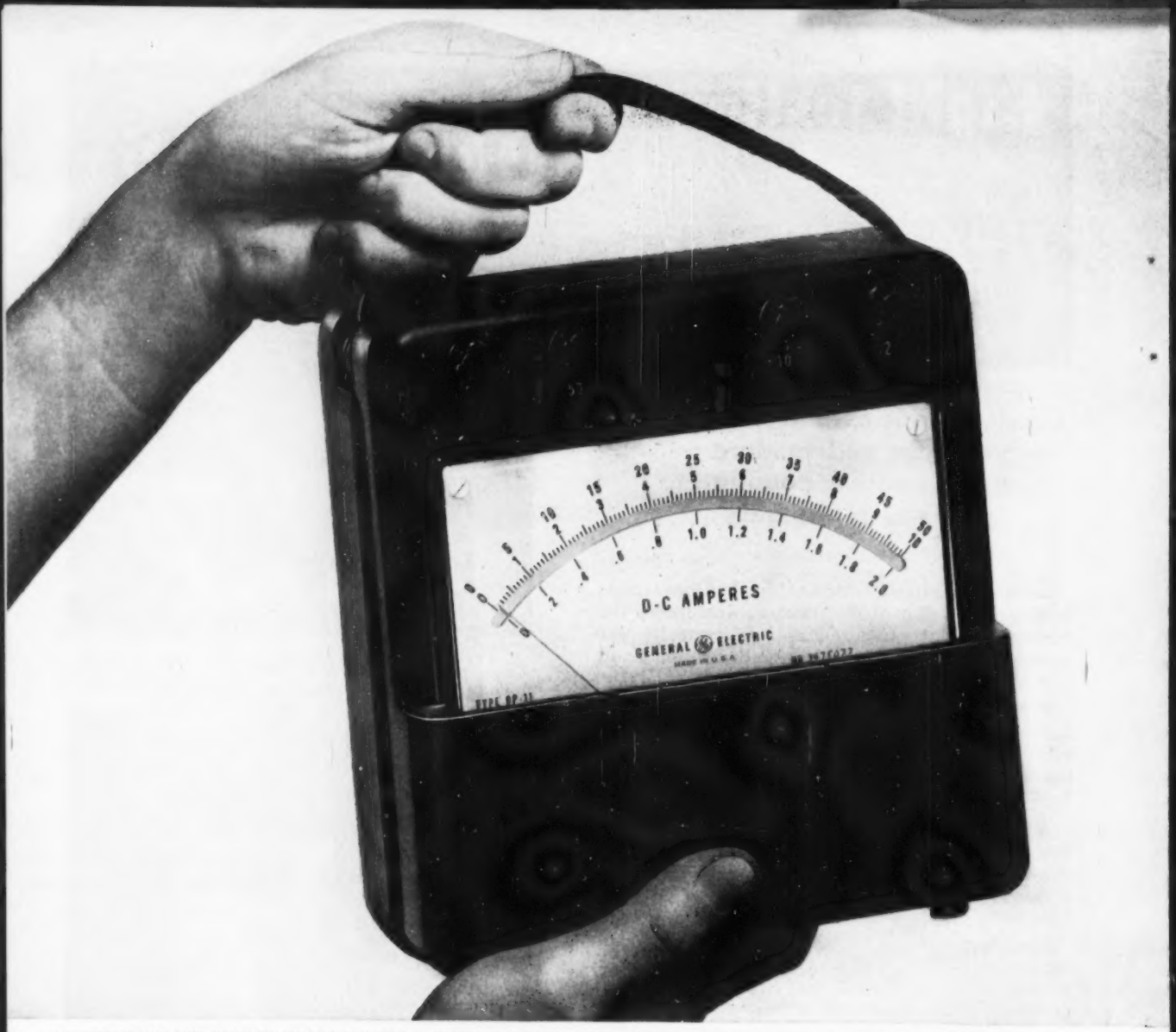
CONDULET — First in the field — STANDARD OF QUALITY

*CONDULETS are made only by CROUSE-HINDS

A Nationwide Distribution Through Electrical Distributors

CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS



5½-INCH SCALE AND SHADOW PROOF DIAL GIVE THIS NEW D-C INSTRUMENT HIGH READABILITY—FOR FAST, CORRECT MAINTENANCE CHECKS

G.E. Announces New Portable Instrument

General Electric's new line of DP-11 portable indicating instruments has been designed with the practical measurement problems of the electrical maintenance man in mind. Readability, capacity to withstand rough treatment, and dependability—these working qualities are inherent in the product features described below.

Twin to the DP-11 line is the new DP-12 instrument group. The DP-12 offers a more refined instrument for applications where higher accuracy is desired—laboratory testing, and high-accuracy field work. In addition to this greater accuracy the DP-12 has all the improved features of the DP-11.

IMPROVED READABILITY

The dial of the DP-11 indicator is a long, readable 5½ inches. By making readings easier, this feature cuts down errors, speeds maintenance schedules.

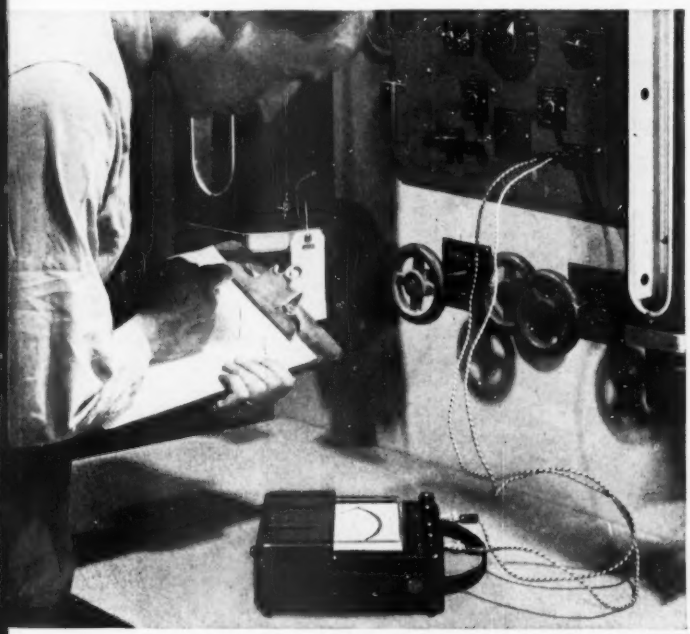
Readability is further increased by the molded plastic window, which permits flooding the entire scale with light from the front and three sides.

STURDY DESIGN

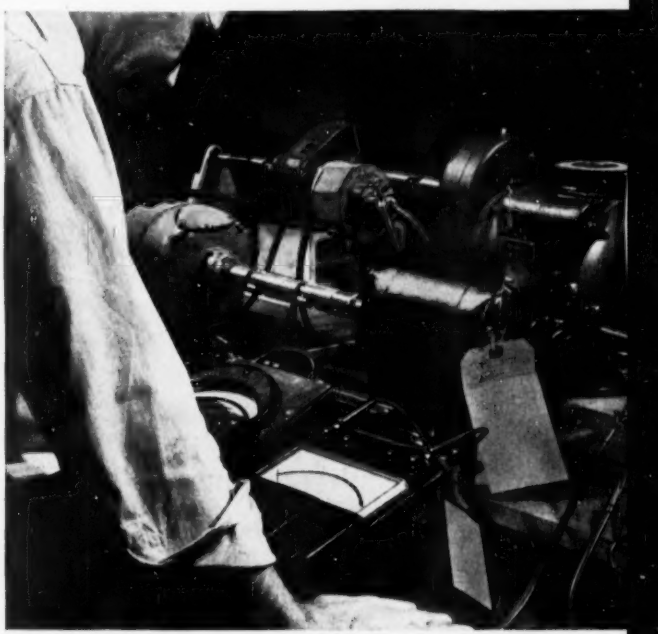
A thick Textolite* case enables the DP-11 instrument to stand up against the rough handling unavoidably given portable instruments. Also, shocks and jars are absorbed internally by spring-mounted jewel bearings.

CONCENTRIC MAGNET SYSTEM is shielded against stray magnetic fields with a soft-steel ring. Self shielding helps to assure uniformly accurate readings. System provides maximum magnetic efficiency.

PROTECTIVE EXTRA-THICK CASE is molded of durable Textolite* for greater resistance to breakage. Rounded corners also contribute to strengthening the case.



EASY-TO-READ DP-11 INSTRUMENT helps to speed checking of critical testing facilities required for producing jet aircraft mass flow-meters. Scale clarity reduces possibility of error.



HIGH-ACCURACY DP-12 PORTABLE INSTRUMENT (indicator at right) is used in conjunction with tachometer generator sets to calibrate rpm indicators for switchboards.

Featuring Improved Readability, Sturdiness

This all-round durable construction means the General Electric DP-11, -12 instruments will give you repeatedly good performance with a minimum of maintenance and out-time.

MANY TYPES AVAILABLE

Both the DP-11 and DP-12 portables are available in several ranges as ammeters, voltmeters, millivoltmeters, milliammeters, and microammeters. The DP-11 is accurate within ±½ of 1% of full scale and the DP-12—within ±¼ of 1% of full scale value.

MORE INFORMATION

For further details on how the DP-11, -12 instruments can help you to speedier, surer measurements, contact your G-E Apparatus Sales representative, or write for bulletin GEC-979 to Section 602-254, General Electric, Schenectady 5, New York.

*Reg. trademark of General Electric Company

GENERAL ELECTRIC

Remember that Red Hot 1949 Briegel Combination Indenter and Fitting Deal? It broke all records then so here we go again!

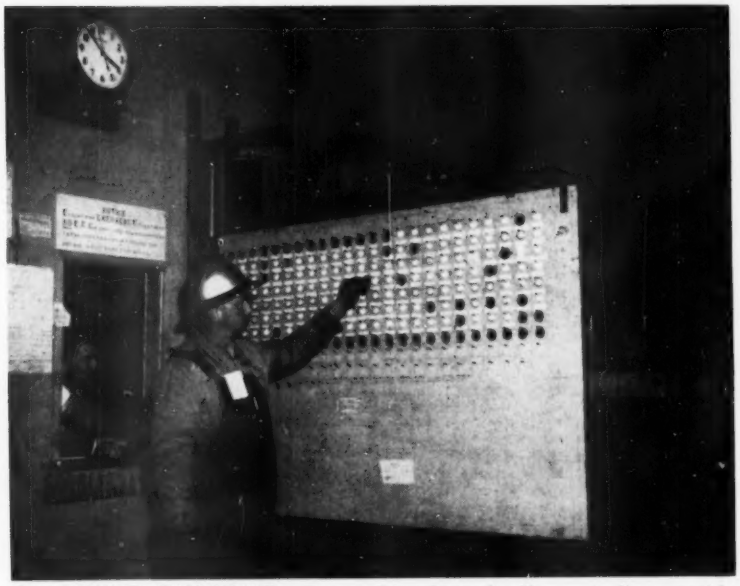
For three months only, August, September and October, a Special Package Offer of 200-½" B. M. Couplings and 400-½" B. M. Connectors. Free of extra cost in this package will be 1 No. 606 Briegel ½" Indenter!

Stock up today with this Deal that sold out the last time it was offered.

BRIEGEL METHOD TOOL CO.

GALVA, • ILLINOIS

Practical Methods



SELF-SERVICE BRASS BOARD rolls out of timekeeper's office on trolley assembly into field shop area where mechanics file by to secure or surrender their brass tags. Scheme permits 173 mechanics to check out in about three minutes time.

Roll-Out Brass Board Slashes Check-Out Time

SHOP ORGANIZATION

On large electrical construction projects, where numerous mechanics are employed, checking-in in the morning and checking-out at night can be a time consuming chore. Actual amount of time consumed each day will vary with the number of men on the job and the check-out system used.

Standard procedure is to use the brass tag system where each man is assigned a number and a brass tag bearing that identifying number. Each mechanic takes out his tag when he reports to the job in the morning and surrenders it when he leaves at the end of the day. Normally, a timekeeper hands the men their tags over a counter after taking them off pegs on the "brass board" in the timekeeper's office. At the end of the day the mechanics hand in their tags and the timekeeper sorts them out and replaces them on their proper pegs. But, when there are a hundred or more men on the job, this operation can take considerable time.

On a large construction project in the Chicago area where there were some 173 electricians employed, Emerson-Comstock Co., Inc., devised a self-service check-in and check-out scheme. Each man took and replaced his own tag each day. The conventional brass board was used. But, instead of having it permanently fastened on the inside wall of the timekeeper's office, it was suspended from a trolley assembly (section of Unistrut channel) which extended out into the fabrication shop area.

Each morning, the timekeeper pushed the "loaded" board out through an opening in the office wall into the shop proper and the men picked their own tags. Then the board was pulled back into the office and the timekeeper began his work of checking on absentees. About ten minutes before quitting time, the board was pushed out into the shop area again and the mechanics replaced their "brass" as they filed by. After the rush was over, the board was again pulled back into the office area.

Everyone on the project liked the self-service method. It made the job easier for the timekeeper and the mechanics no longer had to wait around to surrender their tags. More important, mechanics could remain on their jobs longer. According to field shop personnel, it takes approximately three minutes for 173 mechanics to check-out at the end of the day—a considerable saving in time over former methods.

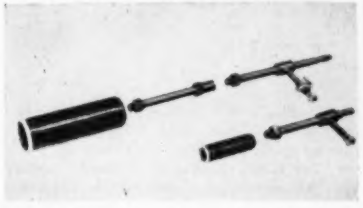
Water Feed Speeds Concrete Drilling

CONSTRUCTION

A new swivel action water feed attachment for use with special Tilden Rotary Koncrete Kore Drills of 1½-in. to 8-in. diameter increases drilling speeds up to 300% over that possible with ordinary concrete drills, according to the Tilden Tool Manufacturing Company. In addition the water lubrication prolongs the effective cutting life of the sintered-carbide tipped drills.

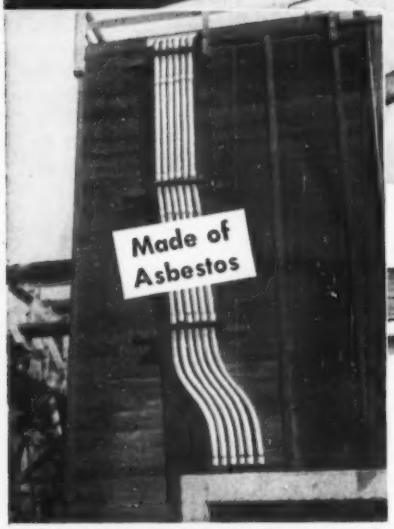
Water flowing through the drill's core cavity efficiently removes cuttings and debris while it lubricates and cools the drill. The water attachment fits standard garden hose connections; includes a convenient shut-off valve so mechanic can control water flow; permits continuous drilling without pause

DRILLING CONCRETE is a one-man operation with swivel water feed attachment to lubricate and cool drill and wash away concrete cuttings. Net result is faster drilling and longer drill life.



DRILL SET includes sintered-carbide tipped core drill, extension shaft and water feed swivel attachment with control valve; can be used with standard electric or air drill with ¾-in. chuck or larger.

Installed over 18 years ago on this bridge, Transite Conduit is still on the job despite the attack of corrosive fumes, weather, and vibration.



Resists the Elements: Transite Ducts are standing up far longer than other materials on this cooling-tower wall despite corrosive conditions. Transite's exceptional corrosion-resistance practically eliminates maintenance and replacement costs through the years.

Outlasts other Materials: When other ducts failed to stand up under the streets of a city in the Far West, Transite Ducts were installed. Their life expectancy is far greater than that of the ducts they have replaced.

That's why TRANSITE® DUCTS stay on the job despite corrosive fumes, soils and weather

If you're looking for a conduit that will stand up for years in tough service . . . use Transite Ducts that not only resist corrosion but are immune to electrolysis, too.

Transite, you see, is made of asbestos and cement . . . two naturally corrosion-resistant materials. It stands up in corrosive cinder fills, salt marshes, and other troublesome soils. It also withstands the attack of smoke, fumes . . . and weather conditions will not shorten its service life. Since it is inorganic and nonmetallic, Transite also is immune to electrolysis or galvanic action.

You will find that Transite Ducts save you money on your cableway system not only by staying on the job longer . . . but by holding down the initial cost, too. For further information write Johns-Manville, Box 60, New York 16, N. Y.

4 OTHER REASONS WHY TRANSITE DUCTS DO A BETTER JOB AT LESS COST:

1. Incombustible. Transite will not burn or contribute to formation of smoke, gases, or fumes. It confines burnouts and protects adjacent cables.

2. Permanently Smooth Bore. Transite makes long cable pulls easy. Danger of damage to cables is also minimized.

3. Easy To Install. Transite Ducts are light weight, easy to handle. Joints are quickly made. And, long 10-foot lengths reduce the number of joints in the line.

4. Higher Thermal Conductivity. Cables run cooler in Transite Ducts, reducing I^2R losses, increasing current capacity, and prolonging insulation life.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

to add cooling lubricant to drill. The attachment and drills are specifically designed for production drilling of holes more than 4-inches deep where numerous holes are required; will cut through crossed reinforcing rods and can be used with standard electric and air drill motors with ¾-in. chuck size or larger and with No. 3, 4, and 5 Morse tapers.

PULLING CONDUCTORS THROUGH conduits is a simple and easy chore with ring-enclosed fish tape. Metal enclosing ring keeps steel tape from snagging and provides ample, safe hand grip for pulling tape out of raceway.

Elevators Aid Underground Maintenance

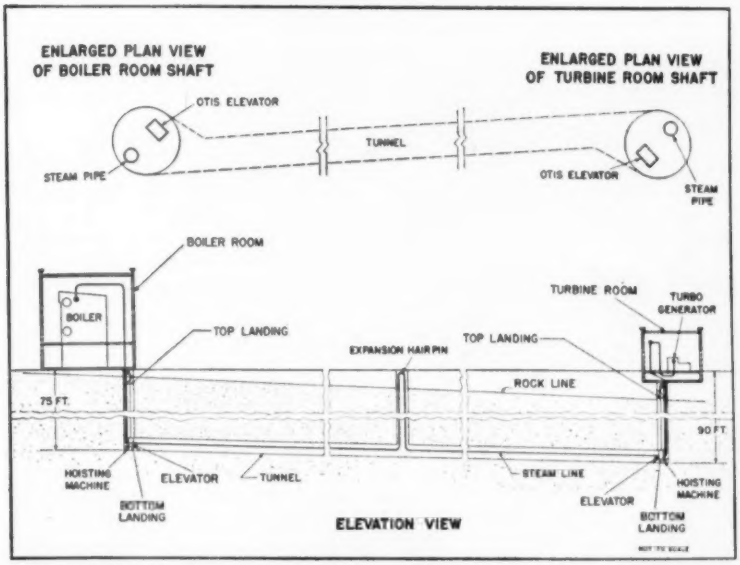
VERTICAL TRANSPORTATION

Frequency of maintenance and inspection operations on a new high-pressure underground steam line at the Argo, Illinois, plant of the Corn Products Refining Co., recently dictated the installation of two small Otis elevators as the most economical means for carrying workers and equipment down to tunnel levels.

These elevators, located at opposite ends of a 1300-foot tunnel, have vertical shafts 75- and 90-feet in depth. The tunnel itself is 10-feet in diameter and is necessary to carry insulated steam lines beneath other previously-installed utility lines from a boiler house to a new turbo generator building that expands Argo's power-generating capacity to 22,500-kw. Since daily temperature changes in the steam lines vary from 50° to 750°, expansion of the pipe line is as much as 54 inches, and frequent inspections and repairs are necessary for this reason.

The elevators are specially constructed to fit into the narrow tunnel shafts. They have capacities of 1200 pounds, have platforms measuring 3-by-3½-feet, operate at 100 ft. per minute, and are driven by 4½-hp geared motors served by a 460-volt 60-cycle system. Top-level landings are 15 feet below ground level and all machinery is fitted into a headroom of only 14½-feet. This arrangement was necessary because the space directly over the shafts was occupied by coal feeders and pulverizing equipment.

Workmen using the elevators walk down stairways from building basements to elevator landings, then descend to the tunnel floor in less than a minute. Shortly after installation it was found that the use of elevators by operating personnel did not interfere with the activities of maintenance men working in the tunnel. As a result, the tunnel now finds daily use as an all-weather passageway between power-station buildings and is used extensively for this purpose.



TURBO GENERATOR, requiring high-pressure steam, is served by 1300-foot steam main carried in tunnel located from 75- to 90-feet below ground level. Access to tunnel is obtained by maintenance and operating personnel via two small Otis elevators operating at 460-volts and moving at rate of 100-fpm.

Battery Yoke-Hook Saves Time

MAINTENANCE

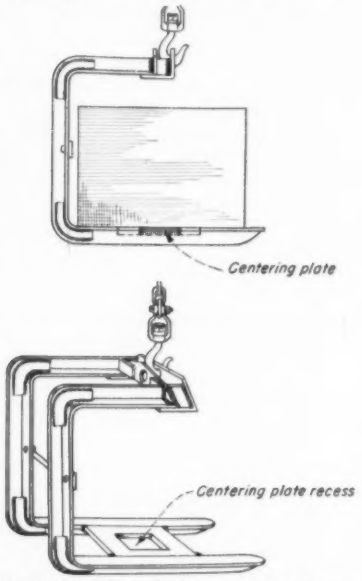
In New York City's Grand Central Terminal, an ingenious storage battery lifting device is used to effect quick battery changes in baggage trucks, it is reported by field engineers of Gould-National Batteries, Inc. Grand Central operates more than 100 battery powered trucks, which must be kept on the job 24 hours a day, seven days a week, to handle mail, baggage and newspapers. A maximum of three minutes per truck is allowed for changing the batteries in the trucks.

Where batteries must be removed horizontally, and when both end and top clearance in the compartment is tight, Grand Central Terminal's rig (see illustrations) is particularly handy.

The pick-up element of the lifting

only
BRONCO 60
Certified
has a
protecting jacket
with CERTIFIED
neoprene
content
the branded
protecting jacket of
all flexible BRONCO 60
Certified portable
cord and cable is certified
to contain not less
than 60% Neoprene
by weight.
BRONCO 60
Certified
manufactured by
Western Insulated Wire Co.,
Los Angeles 58; sold
nationwide only through
Electrical Wholesale
Distributors

A UNIQUE LIFTING device permits batteries in baggage-carrier trucks to be changed in three minutes average time at New York's Grand Central Terminal. A hoist hook lifting yoke reduces manual handling of batteries to a minimum.



DETAILS OF LIFTING yoke-hook construction. The centering plate recess between prongs of hook, a hole in a strip of metal between prongs, accommodates centering plate attached to bottom of each battery, insures the battery against being knocked from the yoke-hook.

device is a large steel yoke-hook welded from simple structural shapes and carried by a monorail hoist. When removing a battery from its compartment in a baggage carrier, the bottom of the yoke-hook is slid into the compartment under the battery (see photo). A rectangular centering plate approximately 5 in. by 8 in. by 1 in. on the bottom of the battery fits into a recess in the plate (see drawing) welded between the two arms of the

CBM...Your Shield of Protection in Fluorescent Lighting

Q. What do the initials "CBM" stand for?

A. "CBM" stands for CERTIFIED BALLAST MANUFACTURERS. Nine of the country's leading manufacturers of fluorescent ballasts comprise the CBM group.

Q. What does "CERTIFIED" mean?

A. It means that ballasts carrying this diamond-shaped shield have been built to rigid specifications designated by CERTIFIED BALLAST MANUFACTURERS. It means that Electrical Testing Laboratories, Inc., has periodically tested these ballasts and found they meet or exceed the exact specifications designated by CBM.

Q. What's the need for specifications?

A. Ballasts are the heart of fluorescent lighting. CBM specifications make certain the ballasts provide best possible performance for the lamps they operate.

Q. How do CERTIFIED BALLASTS benefit you?

A. When fluorescent lamps do not perform in accordance with published ratings, low quality or improperly designed ballasts may be the cause. However, most lamp manufacturers waive this possibility if the ballasts involved are CERTIFIED.

The CBM Shield is their assurance that the ballast is delivering proper electrical values to their fluorescent lamps.

CBM specifications protect the public interest because they provide:

FULL LAMP LIFE — **RATED LIGHT OUTPUT**
LONG BALLAST LIFE — **FREEDOM FROM OVERHEATING**
QUIET, TROUBLE-FREE OPERATION

Write for complete information on the types of CERTIFIED CBM BALLASTS available from each participating manufacturer.

Participation in the CERTIFIED CBM BALLAST program is open to any manufacturer who complies with the requirements of CERTIFIED BALLAST MANUFACTURERS.

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

2116 KEITH BLDG., CLEVELAND 15, OHIO

Insulating News

News of G-E electrical insulating developments that can be important to your business.

G-E VARNISHED CLOTH AND TAPES PROVIDE **MAXIMUM INSULATION AND LONG LIFE**

G-E varnished cloths and tapes were developed after years of research. Their outstanding properties result from a combination of G-E developments, such as the Glyptal® Alkyd Resins and G-E Permafil used in their treatment. With G-E varnished cloths and tapes, you can count on . . .

EXCELLENT DIELECTRIC STRENGTH that affords superior insulation for electrical equipment.

HIGH MECHANICAL STRENGTH that permits extremely tight winding and use where equipment is subjected to mechanical shock or wear.

UNUSUAL FLEXIBILITY. G-E varnished cloths and tapes can be applied easily and quickly, even when the equipment involves irregular and difficult shapes.

HIGH RESISTANCE. G-E Glyptal® alkyd resins, used to impregnate cloths, and G-E Permafil, used chiefly for treating glass fabrics, provide high resistance to oil, moisture, heat, and other damaging elements.

G-E varnished cloths and tapes can be used for wrapping motor coils, protecting cable joints, insulating transformers—and wherever you want maximum insulation and protection.

FOR MORE COMPLETE INFORMATION and free sample folder of G-E varnished cloths and tapes, write: General Electric Company, Section 1328-3B, Chemical Division, Pittsfield, Massachusetts

You can put your confidence in—

GENERAL ELECTRIC

yoke-hook, and acts as a safety device to prevent the battery from shifting position during handling. After positioning the rig, the battery is lifted slightly with the hoist, moved horizontally out of the compartment, and transported on the monorail to the charging racks.

Because of the large number of trucks, battery changing is staggered. Not more than two trucks are permitted in the battery room at a time. The battery in each truck is changed every other day.

Simple Jig for Welding Brackets to 4-in. Boxes

FABRICATION

Rigid support of outlet boxes and conduit runs in slab-type installations is important if outlets are to be kept perfectly aligned in designated positions. Otherwise, conduit or box or both may shift during installation of reinforcing rods or actual concrete pour and realignment may be difficult. Standard practice is to use some type of upright support—rod, angle or channel—mounted to the box and fastened to the deck form.

An L-shaped bracket, fashioned from ¼-in. by ¾-in. channel, was used by Electrical Contractors, Inc., Chicago, to rigidly position 4-in. square (No. 1900) boxes some 12 inches above the floors of an apartment project. Brackets were fabricated in quantity in the field shop, then welded to the sides of the outlet boxes. The assembled units were then distributed to the deck for installation before the conduit crew took over.

First, all channel sections were cut to length, then bent in the L shape and drilled (two holes on L-flange for rigid mounting to deck). For the weld-

SIMPLE WOOD JIG holds 4-in. square outlet box and supporting bracket while bracket is welded to side of box. Metal channel running under jig base forms stationary contact between box and clamped electrode. Welding rod forms second contact a point of weld.

EASY TO HANDLE

Ettco Flex

NON-METALLIC SHEATHED CABLE
in the new
"GRAY" FINISH

- ***more economical on the job!***
- ***easier, cleaner stripping—in less time!***
- ***3-ply insulation resists corrosion . . . extreme temperatures!***
- ***gray outer sheath is smooth, hard, flexible . . . won't crack or deteriorate!***
- ***the perfect cable for residential or industrial construction!***
- ***packaged in handy cartons***

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OTHER PREMIUM quality electrical products by

Ettco

- **Bushed Armored Cable**
- **TW Building Wire**
- **Flexible Steel Conduit**
- **Service Entrance Cable**

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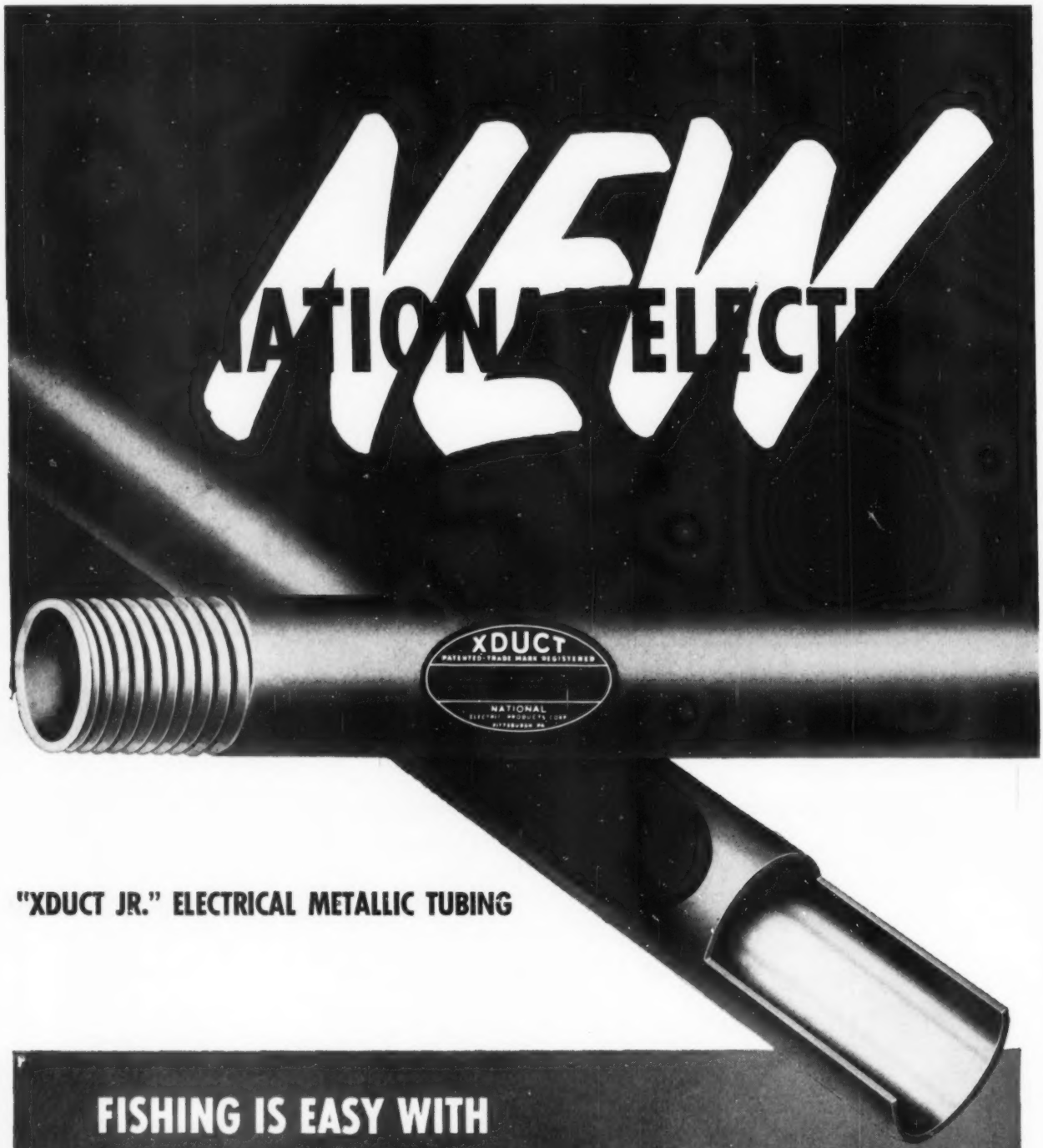
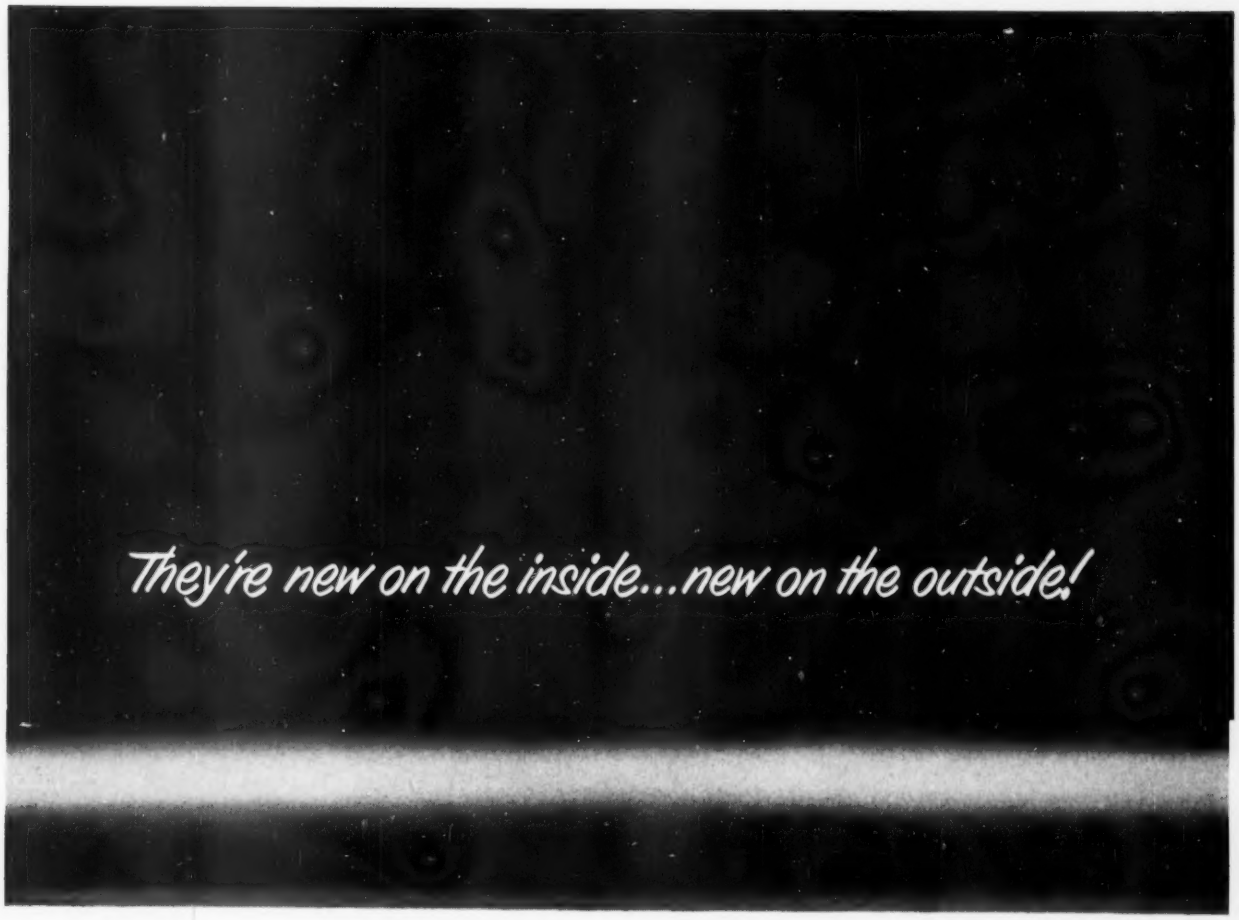


"XDUCT JR." ELECTRICAL METALLIC TUBING

FISHING IS EASY WITH

"X DUCT" CONDUIT

Proved best by actual fish test!



"XDUCT" RIGID STEEL THREADED CONDUIT

Here's what these new conduits mean to you!

1. EASY FISHING—"XDuct's" new aluminum enamel inside coating (patent applied for) was developed through intensive research in connection with important government projects. It provides lubrication as friction builds up between conduit wall and wires. The result: Actual fishing tests conducted with five other leading brands of conduit prove "XDuct" is 66% easier to fish on constant pull—more than twice as easy to start as the second best conduit.

2. SUPERIOR CORROSION RESISTANCE—National Electric's revolutionary new patented electrogalvanizing process electrolytically deposits pure zinc *uniformly* over the entire outside surface of "XDuct" conduit, including the threads. The result: a protective coating that adheres positively to the basic steel . . . possesses superior corrosion resisting qualities.

3. THREAD PROTECTION—Sharp, clean threads of "XDuct" rigid steel conduit are machined *before* galvanizing to assure complete protection from end to end. The result: every hill and valley of threads are completely galvanized.

4. SUPERIOR BENDING—High-ductile steel is used to assure easy bending.

5. DESIRABLE COLOR—"XDuct's" silvery color is highly acceptable for installation in exposed locations.

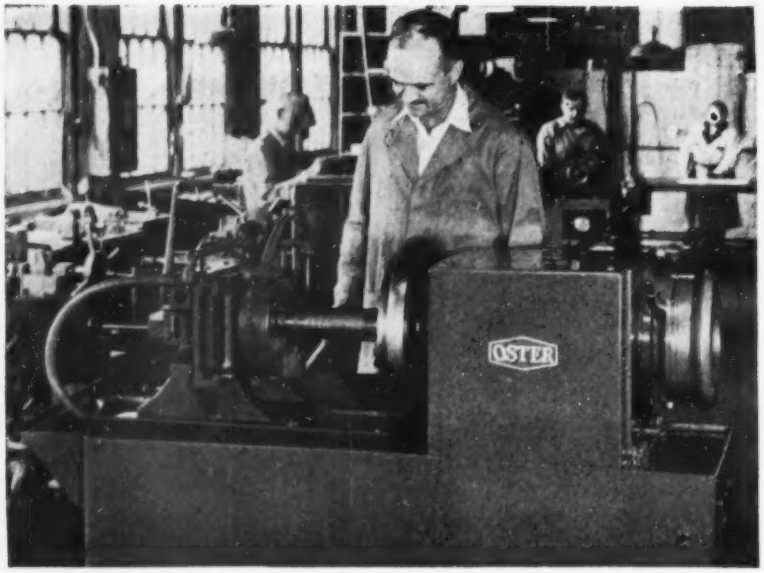
EVERYTHING IN WIRING POINTS TO

National Electric Products

PITTSBURGH, PA.

3 Plants • 7 Warehouses • 34 Sales Offices

LISTED BY UNDERWRITERS' LABORATORIES, INC. • STOCKED BY LEADING ELECTRICAL WHOLESALERS EVERYWHERE



Solution to Tough Threading Problems

The New Low Cost OSTER *Thrift Model*

The newest member of the complete line of Oster money-saving threading machines is the No. 784 Thrift Model. Now available at minimum investment, it threads pipe and conduit quickly . . . efficiently.

Features of the new Oster Thrift Model include a front gripping chuck that is fast and positive. Operated by handwheel, it requires no wrench and handles conduit size change quickly and easily.

Two quick opening, detachable, lever operated die heads cover the entire range of 1″ to 4″. Extra range of the Thrift Model is ½″ and ¾″. These die heads are provided with both positive locking device and means for adjusting all dies simultaneously for over or undersize threads.

The new Oster Thrift Model is quality built to handle tough jobs for the man who has a small budget. For a free, fully illustrated, factual booklet about the Thrift Model, see your local Oster Distributor or write us today.

For Rugged Economical Portable Threading Machines Look to Oster

The Oster No. 422 Power Vise Stand is fast, dependable, and sturdy. It's easy to operate . . . easy to move, and handles all sizes of conduit up to 2″. Pick it up and throw it in the back of your truck. It can take it.

The Oster No. 502 "Pipe Master" with standard range from ½″ to 2″ and extra range of ¼″ and ⅜″ is the answer where a portable machine is needed for shop operation. For complete information about the Oster portable machines, write us today.

THE OSTER MANUFACTURING CO.
Main Office and Factory:
2081 East 61st Street • Cleveland 3, Ohio

1893 • CELEBRATING 60 Years Leadership in the Threading Industry • 1953

ing job, ECI mechanics designed a simple wood jig to hold the brackets and boxes in place. It consisted of a flat piece of wood board with a slotted saddle-block at one end to support the bracket and an opening near the opposite end to seat the box on end. A section of channel iron was mounted to the underside of the board directly under the opening for the outlet box. One electrode of the arc welder was clamped to this piece of channel.

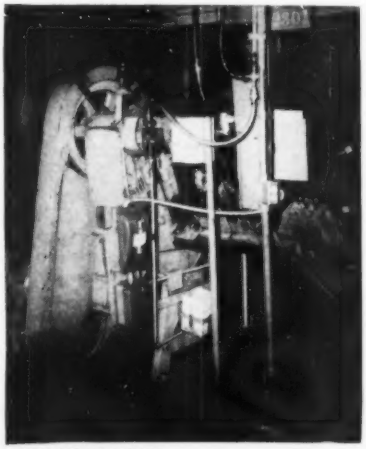
The mechanic doing the welding merely placed the outlet box in the opening where it rested on the electrode channel. The bracket was then placed on the top of the box with its bent end resting in the slotted block. At least four welds were made to securely fasten bracket to box. The welding circuit was completed, through electrode channel, box and bracket, when the mechanic touched the other electrode rod to the assembly.

Flexible Connections Segregate Vibration

CONSTRUCTION

Heavy equipments subject to motor vibration are serviced in the modern plant of Tinnerman Products, Cleveland, Ohio, by short lengths of flexible conduit. Conduit, in turn, is connected to condulet fittings incorporated in vertical conduit runs extending from floor to overhead feeders.

Although circuit wiring extends downwards only to the condulet points, the vertical conduit lines are continued downwards to the wood-block flooring where they are secured by standard threaded pipe flanges screwed into position. These additional lengths of pipe give added rigidity and support.



CONDUIT DROPS, carrying circuit wiring from overhead feeders to condulet junctions with flexible motor connections, are supported by short additional lengths of conduit which are held in place by heavy-duty pipe flanges.

"Received $10,000 in new business from Electrical Contractor Program."

Robert Moran, Secy.-Treas.
Moran Electric Service, Inc.
Indianapolis, Indiana

"New business amounts to $3700 in small contracts plus $4200 in large contracts."

N. D. Giles, Partner
W. J. Giles Electrical Const. Co.
El Monte, California

"New business resulting from mailings is $4500."

Howard R. Pancoast, Pres.
Bryant Electric Co.
High Point, North Carolina

"Excellent promotion! Volume of new business $1800."

Arthur V. Sirianni, Pres.
Sirianni Electric Company
Portland, Oregon

"Your promotion is a terrific deal! New business $1500 thus far."

Roy A. Miller, Pres.
Miller Electric Service Co.
Cambridge 39, Mass.

"Our business volume for 1951 was 60% over 1950 . . . due to your fine advertising program."

T. H. Carmichael, Vice Pres.
Sheffield-Murray Electric Co.
Kansas City, Mo.

"We are sure we have benefited from your program."

R. M. Thompson, Pres.
Electrical Constructors, Inc.
Houston 3, Texas

Proof of Higher Sales Records!

Read how these Electrical Contractors boosted their business with Sylvania's powerful promotion. You can, too!

The enthusiastic comments on this page are typical of scores we have received from Electrical Contractors all over the country praising the sale-boosting power of Sylvania's Qualified Lighting Contractor Business Building Program.

It's a 3-part Program

The full program consists of (1) National ads and a great popular television show, (2) a planned publicity campaign, (3) a personalized direct mail campaign.

It all features the striking, colorful Qualified Lighting Contractor Emblem. This ties in with full-page ads in Time, Business Week, Newsweek and other magazines. It's also displayed on the great TV show "Beat the Clock."

Also, this emblem, in decal form, is to be displayed on your trucks and in your store windows. It's carried in all the hard-selling direct mail folders and material which Sylvania mails to your prospects.

Sorry we haven't the space here to go into all the many details of this promotion. But, believe us, it's a complete program that follows through . . . from attention-getting ads to zooming sales! The coupon brings you full information and sample brochure. Mail it NOW!

QUALIFIED LIGHTING CONTRACTOR SYLVANIA

Sylvania Electric Products Inc.
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I'm interested in upping my sales records. Please send me full information about Sylvania's Business Building Program for Electrical Contractors.

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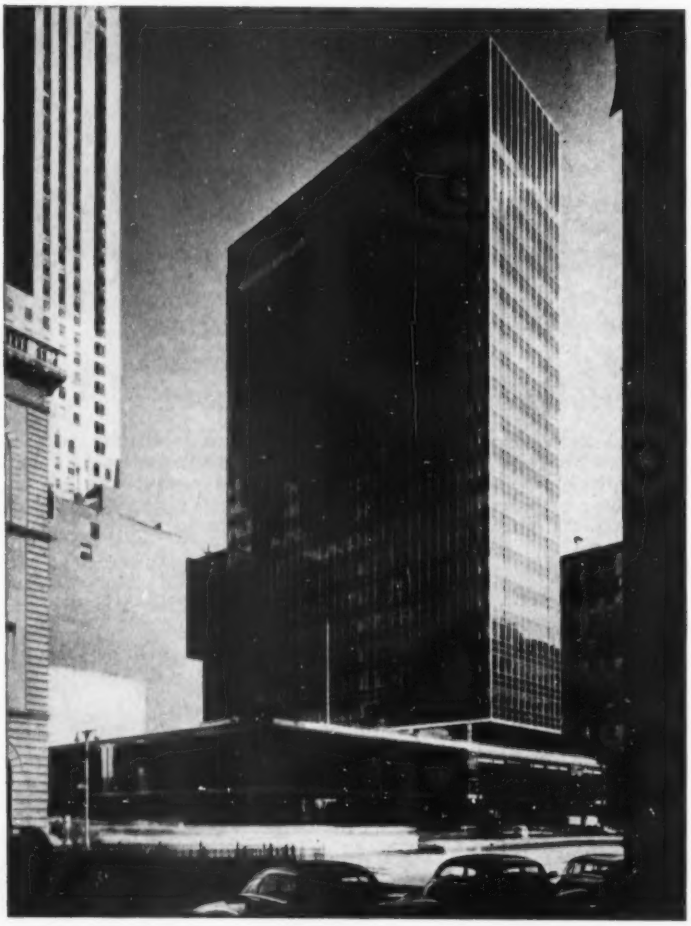
In Canada: Sylvania Electric (Canada) Ltd., University Tower Building, St. Catherine St., Montreal, P. Q.

How to provide for 131,000 ELECTRICAL OUTLETS ...now or in the future



SPECTACULAR LEVER HOUSE, on Park Avenue, New York City, will always remain electrically modern because of its General Electric Q-Floor wiring system. However offices may be rearranged, it will always be easy to provide neat, unobtrusive electrical outlets for office machines, telephones, and inter-office communications systems.

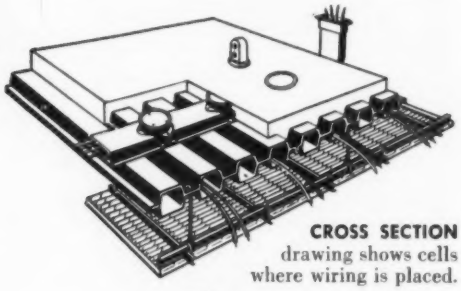
SKIDMORE, OWINGS & MERRILL, *Architects.* **GEORGE A. FULLER CO.,** *General Contractors.* **SMITH and SILVERMAN,** *Electrical Engineers.* **FISCHBACH and MOORE,** *Electrical Contractors.*

Lever House uses General Electric's Q-Floor wiring system

Lever House, like many other modern buildings, is constructed with Q-Floor, a cellular steel flooring that saves materials, weight, and construction time. General Electric provides connections that make the Q-Floor cells available for wiring — so that each Q-Floor cell becomes an underfloor raceway. An electrical outlet, therefore, can readily be located in any one of the 131,000 square feet of floor space in Lever House.

With General Electric Q-Floor wiring, wire moldings, wire tacked along baseboards, or wire around doorways can be eliminated. Outlets for power, inter-office communication sets, or telephones can be added or relocated within six inches of any spot on the floor—at any time—in quick time.

For more information about Q-Floor wiring, call your G-E Construction Materials district office. Or, write to Section C23-818 Construction Materials Division, General Electric Company, Bridgeport 2, Conn.



CROSS SECTION drawing shows cells where wiring is placed.

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GENERAL ELECTRIC

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CATALOGS, BULLETINS
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NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

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Product News

Conduit Straps (1)

A new line of malleable iron straps with greater strength, less weight and improved support. Design provides a uniform, streamlined series of one-hole straps for rigid conduit (½ to 6 inches) and for E.M.T. (½ to 2 inches). Deeper ribs are claimed to give greater strength, thus allowing less material elsewhere. Narrower straps can be placed closer together or to equipment when particular installation requires it. Sizes for all fittings are cast in raised numerals integral with top of base. A letter "C" or "E" on underside of fitting indicates whether it is for rigid conduit or E.M.T., respectively.

Thomas & Betts Company, 36 Butler St., Elizabeth 1, N. J.

Plug (2)

FG Flex-A-Plug is designed for use with the Flex-A-Power distribution system. Working on the same principle involved in plugging into a wall socket, the new Flex-O-Plug taps power from heavy current-carrying FVK Flex-A-Power Busway for machines and other current-consuming equipment. Installation is made easier by new hanger clips which hold plug in position while screws are tightened to anchor it to the Flex-A-Power housing. Electrically, it features the same type of interior used in HCI safety switches. This interior operates on the circuit breaker principle of arc interruption. The use of grid pins, magnetic repulsion and other circuit breaker principles to interrupt arcs gives this interior a high momentary current rating, the ability to resist heavy current surges without damage. Available in 30, 60, 100 and 200 ampere ratings.

Trumbull Electric Department, General Electric Co., Plainville, Conn.

Meter Socket (3)

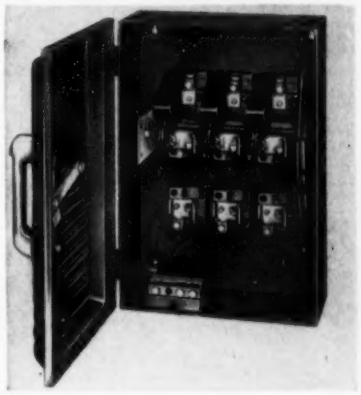
Increased wiring space is featured in a new design in die cast watthour meter socket, which conforms with EEI and NEMA standards as well as Government Standards QQA 591. External hubs for weatherproof, watertight die cast socket allow increased working area for wiring. No special tools are required to reverse the jaws in the field. A fifth or sixth jaw can be added conveniently where required. Plated pressure connectors for both line and load terminals will accommodate up to No. 1 wire. Ground neutral terminals will accommodate two No. 1 wires. A wide variety of hub arrangements and automatic circuit closures are available to meet a wide range of applications.

Square D Company, 6060 Rivard St., Detroit 11, Mich.

Alarm Signal (4)

Designed for modern condensed panel space requirements, the new Model 400 Tel-A-Unit is a self-contained signal alarm unit utilizing the new universal series "100" Circuits which permit over 100 variations in sequences using hermetically sealed or general purpose plug-in units. Horn silencing and lamp reset pushbuttons are integrally mounted on the alarm housing. Any number of these units may be wired together on the same panel to one common power supply and one common horn. All power supply, horn and field trouble contact wiring is conveniently grouped in unit terminal housing and ready for immediate signalling or monitoring service.

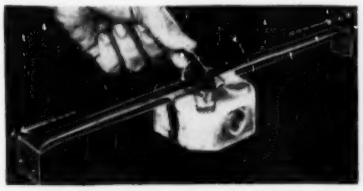
Tigerman Engineering Co., 4332 N. Western, Chicago 18, Ill.



Safety Switch (5)

A 200 ampere front-operated safety switch with visible blades. Front operation permits space-saving installation by recessing or close-ganging batteries of switches. An oversize handle shows up distinctly from a distance, indicating positively whether switch is "on" or "off". Now available are 30, 60, 100, and 200 ampere Noark switches, for use in 250 and 600 volt lines. Other sizes up to 1200 amperes are available with conventional side operation. A feature of the Noark switch is the design of the fuse-holder, with pressure spring located under fuse where unaffected by fuse heat. High-pressure lever action gives minimum contact resistance.

Federal Electric Products Company, 50 Paris St., Newark 5, N. J.



Bar Hanger (6)

A new, no-notch bar hanger which consists of three parts: female bracket, male bracket and stud with lock clip. It is adjustable by loosening lock clip and extending brackets to required space between joists. Closing clip after hanger is in place locks brackets for a permanent installation. Right angle design of bracket, notched so points will hold assembly in place for nailing, assures straight line positioning. Primarily designed for shallow or deep boxes in new construction, hanger is multi-purpose and can be adapted to re-wiring old work. Available in two adjustable sizes for all outlet boxes: No. 560 from 12 to 18 inches and No. 561 from 18 to 26 inches.

Blackhawk Industries, Dubuque, Iowa

MW

ANOTHER

midwest

EXCLUSIVE

"Crimped Set Screw" fittings for thin wall conduit

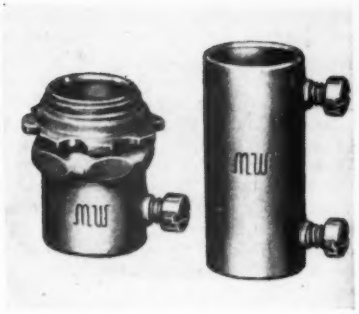
Set screw cannot fall out because it is "locked in"

Midwest Electric Mfg. Company

MANUFACTURERS OF ELECTRICAL WIRING PRODUCTS

1639 W. WALNUT STREET

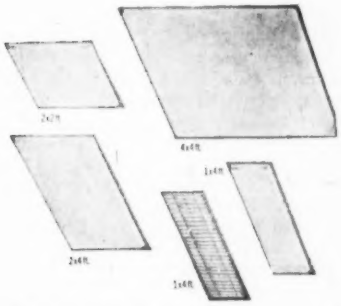
Chicago 12, Illinois



Connector (7)

Specially crimped set screw on EMT connectors and couplings gives the exclusive feature of a locked set screw to prevent loss. Set screw cannot be backed off from the seamless steel connector or coupling threads. Screw does not interfere with assembly of fitting to conduit. Available in sizes: ½-in., ¾-in. and 1-in.

Midwest Electric Manufacturing Co., 1639 W. Walnut, Chicago 12, Ill.



Lighting Units (8)

Beta-Plex in the series of Wakefield Geometrics designates modular lighting units for recessed mounting in suspended ceilings in multiples of 1-ft. by 4-ft., 2-ft. by 4-ft., and 4-ft. by 4-ft. Ballast and lampholders are contained in an individual metal housing. It is provided with hook-on suspension points for the swing-down Plexiglas panels. Diffuser panels are formed with an arch from edge to edge for rigidity. The surface of the plastic is of matt finish to minimize glare from below. Diffuser panel swings down at contact of a touch rod, and may be lifted out. Replaced and swung up, they are held in place by touch-latches. One Beta-Plex unit may be used individually to illuminate a small area, or hundreds may be installed as separate units or in combinations.

F. W. Wakefield Brass Company, Vermilion, Ohio.

Voltage Tester (9)

A new voltage tester designed for use by electricians, maintenance men and electrical contractors. It will show nominal line voltages from 110 to 550 ac, and 110 to 600 dc, as well as distinguish between ac and dc and show polarity of dc lines. Prod handles are integrally molded to Neoprene insulated leads and include tip insulation and safety rings. Interior construction features a solenoid coil, layer-wound on a one-piece Nylon spool. Coil is secured at both ends to prevent movement within the case. Coil leads have been isolated to avoid "cross-overs" and possibility of shorts. A neon lamp in parallel with the solenoid provides a double check on circuits.

Ideal Industries, Inc., 1041 Park Ave., Sycamore, Ill.

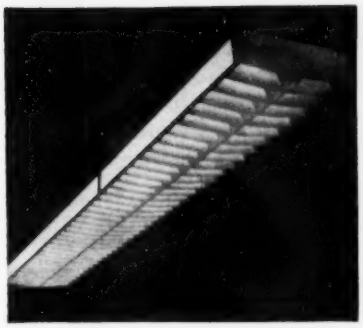
Electronic Relay (10)

A new electronic relay which is highly sensitive to resistance changes and can be varied by a stepless dial. It may be used to start or stop a fractional horsepower motor directly when a contact making ammeter, voltmeter, or wattmeter reaches a required meter reading. Other uses include liquid-level control, sorting of small parts, and operating of lights, solenoids, and contactors wherever there is sufficient change in the resistance of a circuit. Two single-pole double-throw contacts permit control of independent systems, and a simple jumper change sets the relay for normal or reversed operation. Dial may be remotely controlled from as far away as 500 feet, and may be locked when set. Power requirements are 115/230 volts ac, 50/60 cycles, and should not exceed 10 volt amperes. Contact rating is: inrush 30 amps, carry-10 amps, break-10 amps on normally closed contacts and 5 amps on normally open contacts. Break inductive load for 125 volts dc is 0.2 amps normally open and 0.1 normally closed for 250 volts dc, it is 0.1 normally open and 0.05 normally closed. Relay enclosure is weather resistant and dust tight, making it suitable for both indoor and outdoor installations.

General Electric Co., Schenectady 5, N. Y.

Fluorescent Fixture (11)

A new fluorescent fixture design, named HOLO-77. It is completely integrated unit incorporating five basic design features. A sectional beaded channel, known as the Uni-Race carries the fixture installation whether mounted individually or in continuous runs. Uni-Race sections make telescopic union with Uni-Race coupler. Coupler is offset so that each



fixture in continuous runs is automatically spaced with calculated clearances between each unit. Multiple knockouts in the Uni-Race will receive practically all commercial dual stem sets. Channel and coupler are constructed to receive stems directly or in conjunction with side clamp hangers. The unit is pre-wired to a terminal block connector. Heart of the unit is a "V" type girder capable of supporting more than 40 pounds at center without perceptible deflection in eight feet. It is available in 40, 62 and 75 watts. Side panels are available in all-metal, metal and plastic or metal and glass.

Gibson Manufacturing Company, 1919 Piedmont Circle, N. E., Atlanta, Ga.

Lighting Fixture (12)

A new lighting fixture called the Baker Square. Once it is aligned square with the pattern of a ceiling or room design, it stays square. This is accomplished by means of a patented device called the Inter-Plane Lock, composed of two interlocking metal blocks which mate automatically and accurately. Jars, vibrations, relamping or adjustments may move the fixture, but weight of unit forces perfect re-alignment. Installation is simple. Inside the mounting lock, the lower block of the lock is permanently suspended from a metal strap. When unit is installed, this strap is adjusted independently to position fixture body. Upper block of lock then mates inside the permanently aligned lower block and suspends the pendant fixture in perfect alignment. Unit provides maximum levels of glareless illumination in both directional lens and silverbowl lamp. Available as either ceiling or pendant fixtures.

Baker-Barkon Company, 1335 S. W. Morrison St., Portland, Ore.

MARTINDALE

TYPE "C" COMMSTONE HOLDER

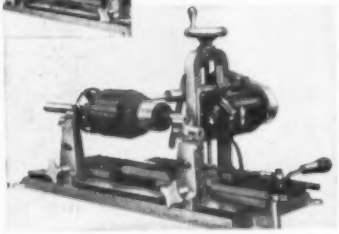
Holds Commstones rigid and true for concentric resurfacing of commutators and slip-rings while running at normal speeds in their own bearings. Grinds commutators up to 4¾" wide. Used with two Commstones in stone holder or one Commstone in 2" box.

BLOWERS and VACUUM CLEANERS

Available in 4 sizes from ½ to 1½ H.P. Suction attachments for all sizes. Write for information on other blowers.

BENCH-TYPE UNDERCUTTER

AT LEFT—Undercutting Vertical Commutator.
BELOW—Undercutting Horizontal Commutator. Note V-support at right raised to compensate for smaller shaft diameter.



Model HV-3 is a precision built, rugged, fast and accurate undercutter with a wider range of armature sizes and shaft lengths than any similar machine being built.

ADJUSTABLE BENCH GROWLER

Has adjustable jaws with face length of 2½". With jaws closed will test armatures as small as 1" diameter. With jaws open, will accommodate armatures as large as 18" diameter. Available with or without meter. Also six other models.

Write for New 64-page Catalog No. 29 describing these and many other products for Industrial Maintenance, Safety and Production

MARTINDALE ELECTRIC CO.

1309 Hird Ave. Cleveland 7, Ohio

Instrument (13)

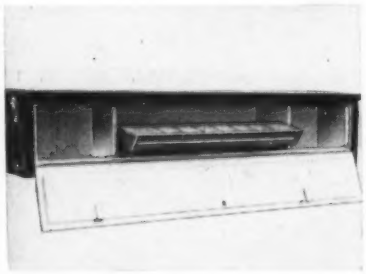
A new and improved insulation tester, Model 500, combines four ohm ranges, and is portable. It will measure the exact leakage of all insulation from zero to 200 megohms at a test potential of 500 volts dc. It has a built-in power supply. The 4⅛-inch rectangular meter with a zero to 200 microampere sensitive movement guarantees readings on all ranges. Instrument is suitable for production testing and for plant maintenance needs. It is housed in an oak cabinet with a removable hinged cover, and comes complete with self-contained batteries, and test leads.

EPCO Electronics, Inc., 140 *Liberty St., New York 6, N. Y.*

Intercommunication System (14)

A new and complete line of intercommunication systems called "Private Line" systems. It will provide intercommunication facilities for businesses needing as little as two telephones to companies requiring thousands of telephone lines. It ranges in scope from a 10 line automatic system to a 50 line automatic system which can be expanded to over 5,000 lines. Features included in these systems are: executive priority, voice paging, conference facilities, group hunting, and automatic ringing.

Connecticut Telephone & Electric Corp., Meriden, Conn.



Utility Compartments (15)

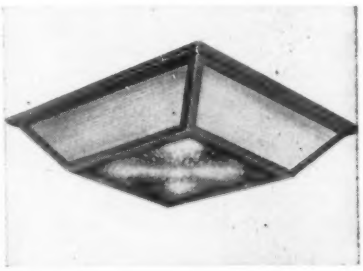
Standardized metal compartments convert an ordinary pickup truck into a handy mobile shop. Tools, parts, and small equipment can be stored, safe from weather, dust or misplacement. Removable trays with adjustable partitions provide separated storage spaces for small parts. Trays slide forward for easy accessibility. Compartments expand truck's carrying capacity. Three sizes are available—72-in., 74-in. and 105-in. All measure 12-in. wide by 14-in. high. The smallest has a single door; the two larger sizes have double doors. Door handles are flush-type. Compartments can be mounted flush to truck body. Overhead center ladder racks, or overhead side angle ladder racks, can be mounted on any truck body with these utility compartments.

J. H. Holan Corporation, 4100 West 150th St., Cleveland 11, Ohio.

Lighting Unit (16)

This lighting unit, PL-6, is used for the illumination of walks, steps, gardens, patios, hospital night light, marker light and protective lighting. Features include heavy cast aluminum which is rustproof; top and side shielding; Fresnel lens directs light where needed; three mounting methods; weatherproof, glarefree, easily services. For outdoor or indoor use. It uses a 6 watt lamp and can be installed on a utility box for flush mounting in concrete, stone or plaster walls. Exposed wiring requires an LB condulet.

The Spero Electric Corporation, 14838 Euclid Ave., Cleveland 12, Ohio



Lighting Fixture (17)

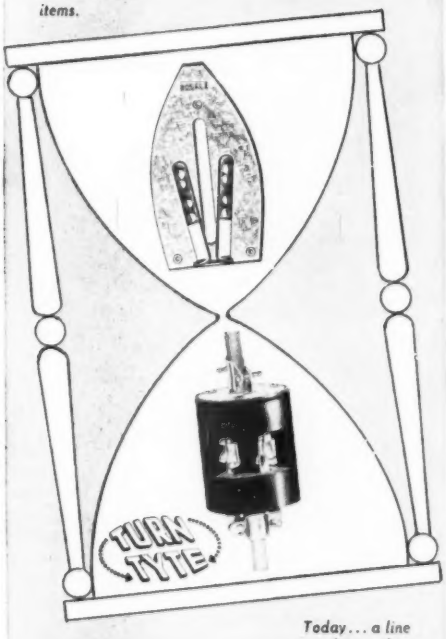
A ceiling-mounted incandescent lighting fixture, Model 6718. Unit has a bold geometrical design to complement a variety of modern interiors, and will accommodate a 200 or 300 watt standard incandescent lamp. The light control is effected through the use of the two control media: diffusing Alba Glass side panels and a 12-inch by 12-inch Pyrex lens in bottom panel. Side panel lighting eliminates brightness contrast between fixture and ceiling; and Pyrex lens provides high level output to visual tasks.

Gruber Lighting, 125 South Ferry St., Brooklyn 11, N. Y.

RODALE

Thirty years later . . .

Thirty years ago . . . a line of less than a dozen items.



Today . . . a line of more than 600 items, including the famous, job-proven TURN-TYTE line.

Joe

Jerry

THIS MONTH the Rodale Manufacturing Company celebrates its thirtieth year in the field of electrical wiring devices. With an eye on the future, we would like to take a backward glance at the past—at the last three decades in which our firm has grown progressively until today it stands among the leaders.

Our growth was made possible because of the loyalty of our wholesalers, the determination of our sales staff, the cooperation and keen judgment of the men and women who design, manufacture and assemble our products. But above all, our growth was made possible because of the foresight, courage, ability and dreams of a man who is no longer with us physically. That man, a great force in our industry for the last thirty years, was our former president, my brother and friend, the late Joseph Rodale.

I can remember Joe dreaming his great dreams of progress and expansion . . . I can recall his belief in the industry he served, and his fond regard for it. When Joe died last year a little part of all of us died along with him, and there was a little more loneliness in the world. On this, our thirtieth anniversary, I would like to dedicate the future to the man who was our past.

Our future is dedicated to Joe Rodale—with the hope that we may serve the industry with the wise faith, determination and abilities he gave to it.

J. I. RODALE,
President

Featuring a complete Quality Line of Proven Electrical Wiring Devices and Nationally-Used TURN-TYTE Interlocking Connectors.

RODALE MANUFACTURING CO., Inc.

EMMAUS, PENNSYLVANIA

Warehouses Located in Los Angeles & Chicago — Representatives in all Principal Cities

So Easy...

yet you can't make a **STRONGER SAFER PIGTAIL SPLICE!**

- No Special Tools
- Only ONE Piece to Handle
- Twists — Threads — Grips — Insulates ALL AT ONCE

IDEAL Wire-Nuts®

Patented, No. 1,933,555
THE SOLDERLESS, TAPELESS WIRE CONNECTORS

Now Better Than Ever!

Contractors' favorite for almost 30 years, IDEAL "Wire-Nuts" have been improved and redesigned to give you still greater advantages and ease of use:

New phenolic compound shells are stronger — have higher dielectric . . . *New buttress threads* guide wire insulation snugly into generous skirt . . . *New knurling* makes it still easier to screw down "Wire-Nuts" for shake-proof, pull-proof splices . . . *New automatic machine assembly and inspection* eliminate all chance of imperfection due to human error.

Only IDEAL makes "Wire-Nuts"—the perfect time-tested connectors that protect *your* reputation. Be safe and sure on every job—USE "WIRE-NUTS."

Spliced for Life!

Contractors sizes 74B and 76B are fully approved as pressure cable connectors for general use in all types of branch circuit wiring.

● Sold Through America's Leading Distributors

MAIL FOR FREE SAMPLES

IDEAL INDUSTRIES, Inc.
1041 Park Avenue, Sycamore, Illinois

Please send FREE SAMPLES OF IDEAL "Wire-Nuts."

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Lighting Fixture 18

Steps, passages, small signs, etc., that demand local lighting, can now be lighted inexpensively with the new "louver Light". Made of Alumalloy, a metal alloy that is both non-rusting and non-corroding. Unit is for areas that require an effective light, softly diffused downward by louvered cover. Typical applications include: hospitals for "dim lighting" signs, passages and steps; street numbers and warehouse numbers; step and darkened passages by installing lights in risers; and for paths and steps in gardens.

Killark Electric Manufacturing Co., Vandeventer & Easton Aves., St. Louis, Mo.

Stripper 19

A new Tiger claw stripper for two and three wire non-metallic cable. It has no moving parts. Tempered steel blades are replaceable. Blades are ground to follow groove in outer braid of three wire cable. Stripper gets inside of box to strip cable, while hand stays outside. Because of its unique design, it is impossible for stripper to slip off cable.

Tomic Sales & Engineering Co., 4864 Woodward Ave., Detroit 1, Mich.

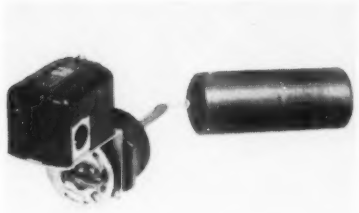
Weatherproof Fans 20

A new line of weatherproof industrial fans for transformer cooling and other severe outdoor applications where the fan must operate unattended. They are available with blade sizes of 16-, 20-, 24-, and 30-in., with certified air delivery ratings from 2820 to 6710 cubic feet per minute.

All sizes are equipped with airfoil cross-

sectional aluminum propeller, and may be obtained either with or without cradle type mounting stand. Fans are protected against elements. The new weatherized motor is equipped with rubber gaskets that seal the removable cast iron end heads. Single phase 110/220 volt motors are equipped with an automatic reset type thermal overload protector to protect windings in event of an overload. Three phase motors for 220/440 volt service are also available, but without thermal protective device.

Propellair Division, Robbins & Myers, Inc., Springfield, Ohio.



Float Switch (21)

A new screw-in tank float switch for condensate pumps, provides automatic control of the liquid level within closed tanks. Flexibility of switch reduces stocking problem to a minimum. Float position can be changed from right to left hand side or vice versa. Contacts may be converted to either open or close on liquid rise. Without removing switch from an installation, float travel may be adjusted in the field. Class 9037 Type HG is styled consistent with the streamline design now being adopted in the pump industry. Switches are available for 110-220 volts and 440-550 volts. Structure is two pole, double break, silver-to-silver, visible and vertical contact. Operating mechanism is of the positive snap action, toggle type.

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

Rigid Conduit (22)

A new white rigid steel conduit with easier bending and wire-pulling characteristics and improved corrosion resistance. This conduit is zinc-coated by a process called "metallizing", which does not harden conduit or form brittle zinc-iron alloy. In this process, pure zinc is sprayed through a flame and on to the conduit in a plastic state. This bonds a controlled, uniform coating of pure zinc to both pipe and threads to provide protection against corrosion. In addition to metallizing process, a new anti-friction inside coating has been added to make wire pulling easy and to provide interior protection against corrosion. Conduit conforms with the American Standards Association specifications, is listed by Underwriters' Laboratories, Inc. and meets all U. S. Government specifications.

General Electric Company, Construction Materials Division, Bridgeport 2, Conn.

Let IDEAL Tools Save Time and Cut Costs on Every Wiring Job..

FISH TAPE, REEL AND PULLER (Patented No. 1,890,945)

3 tools in 1—

Cuts Fishing Time in Half!

Even long conduit runs are easy to handle when you have the BIG, sure pull afforded by an IDEAL Reel and Puller. Tape is always under safe control—in the conduit or locked in the Reel—easy to reel in or pay out—can't kink or spring loose. Complete with tape of finest flat spring steel, oil tempered. Five stock sizes and lengths —50' to 200'.

FLUR-TEST

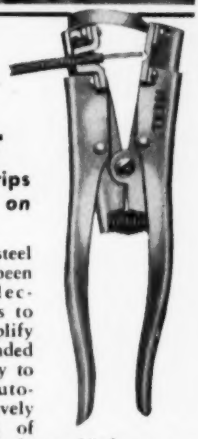
Fluorescent Fixture Tester

Shows Source of Trouble, Right at the Fixture!

Saves time and effort in testing fluorescents. Shows in just a few seconds, right at the fixture whether failure is in the fixture circuit, the tube or the starter. Prevents needless discard of good tubes. Models for 15-40 and 85-100 watt fixtures with exposed starter or with adapter for starter behind tube.

"E-Z" Wire Stripper

Strips Clean, Strips Fast and Saves on Wire!



The rugged, all-steel stripper that has been a stand-by of electricians for years to speed up and simplify stripping of stranded or solid wire. Easy to use as pliers. Automatic stop positively prevents crushing of stranded wire. V-notches on blades save wire by eliminating accidental scoring or cutting of wire. Portion of hardened, replaceable blade also serves as a wire cutter. Six sizes handle all wire gauges from 8 to 30.

Wire Pulling LUBRICANT

Provides a film of lubricant that speeds up wire pulling and protects insulation against strains and breaks. Makes it easier to add wires to conduit already containing wires or to remove wire from conduit. Non-corrosive, non-combustible and non-injurious to hands or clothes. For lead or plastic covered wire or cable. (Not for asbestos covered wire.) Quarts or gallons.

IDEAL WIRING TOOLS ARE SOLD THROUGH AMERICA'S LEADING DISTRIBUTORS

IDEAL **FREE CATALOG DATA**

IDEAL INDUSTRIES, INC.
1041 Park Avenue, Sycamore, Illinois

Please send catalog data on:

- ☐ Fish Tape, Reel and Puller
- ☐ "E-Z" Stripper
- ☐ Wire Pulling Lubricant
- ☐ FLUR-TEST

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

1. Westinghouse Application Engineer
2. Westinghouse Sales Engineer
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4. Electrical Engineer
5. Production Superintendent

Your motor and control problems are local . . . so is Westinghouse application assistance

Do you put a full team on the field when you tackle a motor and control application problem? Are you cashing in on the know-how of your local staff of Westinghouse application engineers? Take a look at this line-up:

Your local Westinghouse sales engineer has a broad knowledge of all Westinghouse Motors and Controls. He knows their capabilities and limitations. He knows how to match motors and controls for maximum production.

Your local Westinghouse application engineer is equipped to analyze any motor and control problem and then develop the best solution. He can handle any application problem from a simple machine tool to a complete production line.

Your local Westinghouse product engineer is a specialist in one type of motor or control. These men work at the local level but operate from a manufacturing headquarters office.

Enlist the services of these men on your next motor and control application job. Call your local Westinghouse office for further details, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21746

Application engineers work out of 126 Westinghouse offices

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Atlanta 2, Ga.	ATwood 1642	Greenville, S. C.	3-7755	Roanoke 4, Va.	6263	Toledo 4, Ohio	GArfield 4625
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Birmingham 3, Ala.	53-2411	Indianapolis 9, Ind.	MArket 3301	Saginaw, Mich.	4-2640	Washington 6, D. C.	NAtional 8-8843
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Evansville 8, Ind.	5-7146	Peoria 3, Ill.	2-5439				
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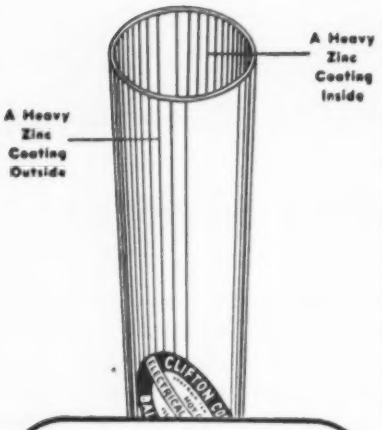


CLIFTON E.M.T.

gives you

DOUBLE THE ZINC PROTECTION

of ordinary E.M.T.

Because of this extra protection, you can often substitute CLIFTON E.M.T. for rigid conduit—and make substantial savings. Wherever electrical metallic tubing is acceptable for outside installations, CLIFTON E.M.T. can be used with complete confidence.

Hot-Dipped Galvanized

CLIFTON E.M.T. is hot-dipped galvanized by a special process which deposits a uniformly heavy coating of zinc inside as well as outside the tubing, and bonds the coating to the steel tubing. Will not flake or chip.

OTHER CLIFTON PRODUCTS include Rigid Conduit, Flexible Steel Conduit, Armored Cable and Pierceway Plastic Duct Wiring Systems.

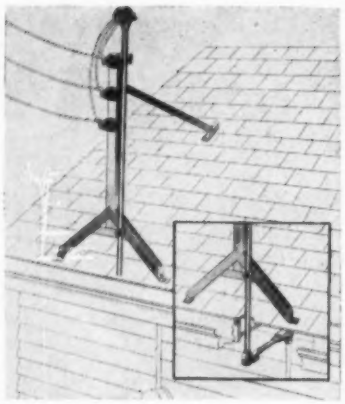
Listed by Underwriters Laboratories, Inc.

WE MAKE NO BONES ABOUT IT . . .

CLIFTON PRODUCTS ARE THE BEST IN THEIR FIELD

CLIFTON CONDUIT CO., Inc.

General Offices
75 Montgomery St.
Jersey City 3, N. J.
Factory: Baltimore, Md.



Roof Bracket (23)

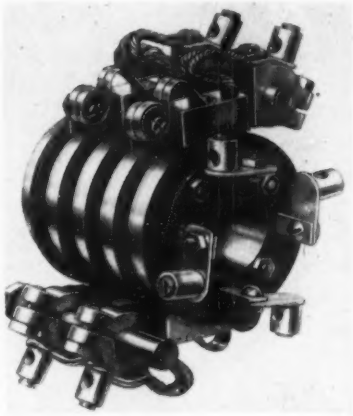
A new, all-welded steel power line service bracket specially adapted for low ranch style small homes. Available in two sizes, bracket provides ample height and mechanical strength to support weight of heavy service lines. Larger 58-in. rack, (P1001) is constructed so that front feet set 32-in. on centers. Back leg automatically rests on roof rafter. Rear leg is bolted to frame and can be adjusted to any roof angle. Smaller (P1002) bracket is designed for farm buildings, garages, etc., and also makes supporting rack for extended service lines. These complete package units have rust-resistant entrance fittings, supplied for either rigid or thinwall. Heavy-duty reinforced insulators are spaced to National Electrical Code specifications.

Utility Service Co., 921—13th Street, Racine, Wis.

Fittings (24)

New, larger service entrance caps accommodate three conductor No. 2 size service cable. Previously the maximum was three conductor No. 4 size cables. New water tight connectors for service cable insure moisture-proof connections despite outside diameter variations for any given size cable made by different manufacturers. Greater take-up results from a longer metal body with more inside taper and mating rubber bushings of similar shape. Bushings come in four easily recognized colors to indicate fitting sizes at a glance. In addition, a removable colored paper disc in each fitting has the size printed on its face. This applies to both two-screw and hex gland types. Colors and corresponding sizes are: yellow 2 No. 8 or 2 No. 6; green 3 No. 8, blue 3 No. 6 and brown 3 No. 4.

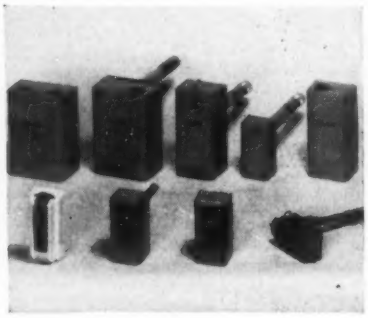
The Thomas & Betts Co., Elizabeth, N. J.



Collector Rings (25)

A new line of all purpose collector rings used for conducting current from a stationary to a rotating part. A wide variety of applications for the rings include rotary signs, amusement rides, reels, laboratory test equipment, cranes, and many other pieces of apparatus having rotating parts requiring continuous current transmission. Sizes run from 1 to 16 conductors, with conductor ratings from 35 amperes, 600 volts, to 75 amperes, 600 volts. Industrial all-purpose collector rings are rated for speeds up to 900 rpm.

Industrial Electrical Works, 1501 Chicago St., Omaha 2, Neb.



Heating Controls (26)

A new line of simplified home heating controls for all makes of domestic oil burners. The line includes nine devices: a room thermostat, master control with bimetallic helix, flame detector and companion master control, transformer relay, fan and limit control, temperature limit control, water immersion temperature control, and a steam pressure control. They may be mounted in any position without leveling, and feature removable covers.

You get ALL these Features when you buy PET Drills!

Reserve Power—for the extra-tough job. Powerful, Continuous-Duty Motors—built in PET's own factory. Dynamically Balanced Armatures—for freedom from vibration.
Six Heavy-Duty Ball and Needle Bearings.
Compact Design—makes hard-to-reach drilling jobs easier and faster.
Aluminum-Alloy Die Castings—for light weight, easy handling.
Forced Ventilation—for cool running.
Precision-Cut, Heat-Treated Gears—for smooth, quiet power flow.

If you want the *best* for your maintenance or production work, take an extra look at the PET Superduty Drill shown here. Check its features! Here's a drill that's made for heavy, continuous duty...with *plus* power per pound . . . built to *work* right and *handle* right on the job.

Normally you might expect to pay extra for such features—in the form of "optionals" that jack up your cost. But that's not true of PET Drills! All these features are standard in the PET Superduty line . . . *and they're available to you at a standard drill price!* That's why the coupon below can save money for you. For free catalog and name of your nearest PET distributor, *mail it today!*

NOW...you can get the RIGHT DRILL for YOUR job!

PET Superduty Drills are available in 54 distinct models and 3 capacities: ¼", ⅜" and ½". Your choice of pistol or saw-type grip. With such a broad line, you don't have to compromise on a drill that's "almost" right! You can choose *exactly* the drill you need for your job. The PET Superduty line includes drills meeting U. S. Government and military specifications.

PET® POWER TOOLS

Plus Power per Pound

PORTABLE ELECTRIC TOOLS, INC.

320 West 83rd Street, Chicago 20, Illinois

In Canada: Portable Electric Tools, Ltd., 452 Birchmount Road, Toronto 13, Ontario, Canada

MAIL COUPON FOR FULL INFORMATION

PORTABLE ELECTRIC TOOLS, INC. EC-83
320 W. 83rd St., Chicago 20, Ill.

Gentlemen: Please send us free copy of your PET Superduty catalog, and name of nearest distributor.

*Name*_____ *Title*_____

*Company*_____

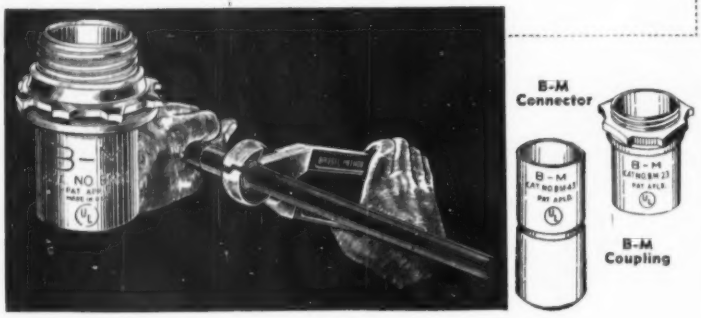
*Address*_____

*City*_____ *State*_____

....YOURS
AT NO COST

Free

This No. 606—½"
WAGNER B-M INDENTER
in every carton containing
200—½" Wagner B-M Couplings
and 400—½" Wagner B-M Connectors



Take advantage of this offer now. It pays to use the WAGNER B-M Couplings and Connectors, and it will be a saving for you to get the No. 606—½" WAGNER B-M Indenter FREE.

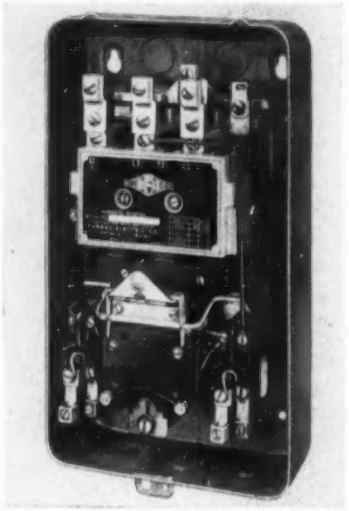
This special package offer is for three months only—August, September and October.

Wagner wholesalers across the country are stocked and ready to serve you.

WAGNER MALLEABLE PRODUCTS COMPANY
222 West Adams Street, Chicago 6, Ill.
Foundry and Factory, Decatur 60, Ill.

Room thermostat has a comfort dial allowing home owners to adjust time cycle to home heating conditions. It can be converted to an automatic day-night thermostat by adding a radio resistor and time-switch clock. In case of flame failures, oil burners can be shut off in four to seven seconds by new flame detector which has a nichrome and quartz detector rod sensitive to 30-degree temperature changes.

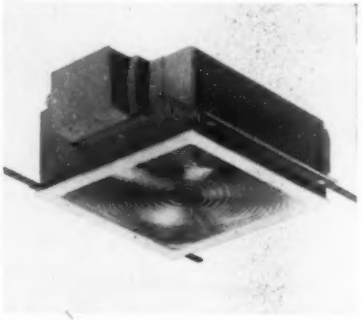
General Electric Co., Schenectady 5, N. Y.



Magnetic Control (27)

A new size magnetic starter and contactor series designated "size 2½". Because the horsepower rating overlaps the size 2, many applications heretofore requiring the purchase of a size 3 control can now use the 2½. Controls which include reversing types are rated 20 hp at 208-220 volt, 30 hp at 440-550 volt ac polyphase; some are available with built-in pushbuttons or selector switch.

Furnas Electric Co., Batavia, Ill.

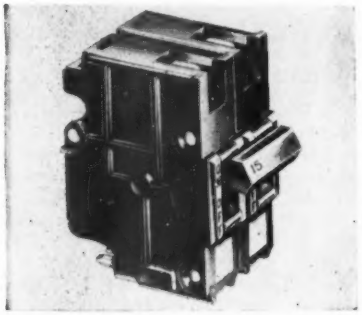


Lighting Fixture (28)

A new recessed lighting fixture which is the exact size of one acoustical tile. Lighting fixtures now harmonize with an acoustical tile pattern. Unit is of rugged construction and comes equipped with Marco Mirrorbrite specular aluminum refectors and a choice of three Corning lenses. Installation is simplified by utiliz-

ing an adjustable plaster frame and Marco's patented J-Box and bar hangers. A hinged frame with spring provides quick and easy re-lamping. The 12-inch by 12-inch frames are finished in eggshell to match tile itself. Frames may be specially ordered in size 13- by 13-inch to overlap tile joints. Also, two and four gang units are available.

Marvin Manufacturing Co., 3071 East 12th St., Los Angeles 23, Calif.



Circuit Breaker (29)

A double-pole circuit breaker which simultaneously opens both poles when one pole is overloaded is for use in gasoline filling stations and other areas where an electrical spark can cause serious conflagration. Thermal-magnetic in action, the simultaneous-trip Stab-lok breaker is designed with a universal-joint type linkage which causes both contact arms to move simultaneously to the "off" position when either one of the breaker poles is tripped by an overload. The thermal action uses a bimetal element which permits harmless momentary current surges to pass without tripping the breaker, but flexes and trips breaker when its predetermined current-time rating is exceeded. The magnetic action comes into play when severe short-circuits occur, giving an instantaneous break in the circuit.

Federal Electric Products Co., 50 Paris St., Newark 5, N. J.

Telephone System (30)

A low-cost two-to-five station interoffice telephone system, called Direct-A-Call, is available to doctors, lawyers, accountants and other business or professional men. It operates from a standard electrical outlet and uses no batteries or tubes. Designed so it can be used either on top of, or mounted on side of a desk, the unit occupies 4-in. by 6-in. space and allows quiet, person-to-person inter-office

General Electric Announces a really NEW Water Cooler!

You've never seen a water cooler like this before—styled to fit the smartest showroom, yet rugged enough to take hard use in a plant. It's the all-new Diamond Anniversary G-E Water Cooler sparkling with far-ahead features.

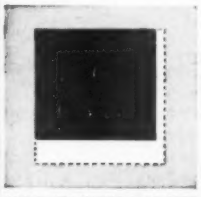
NEW COMPACTNESS, requires 30% less floor space.

NEW SERVICING EASE, all adjustments made through snap-off front.

NEW COOLING DEPENDABILITY because it features the famous G-E compressor—as used in G-E household refrigerators (over 3,500,000 in service 10 years or longer).

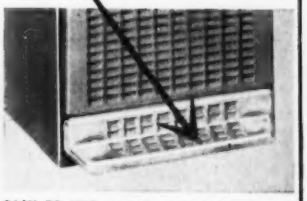
NO SQUIRT, NO SPLASH, NO SPILL, thanks to G-E automatic air-pressure vent, deep-dish basin, and non-squirt bubbler.

LEARN HOW YOU CAN EARN extra income without extra overhead by selling the G-E Water Cooler line. Send in the coupon, or contact your G-E wholesaler.



COMPACT! TAKES 30% LESS FLOOR SPACE without sacrificing capacity or efficiency.

CLEAN AND SANITARY. Electro-polished anti-splash top and gray hammered finish resist soiling.



EASY TO USE. Unit is activated by giant-width foot pedal, directly linked to valve. No groping, even in the dark.

GENERAL ELECTRIC

General Electric Company, Air Conditioning Division, Section EC-17, Bloomfield, New Jersey

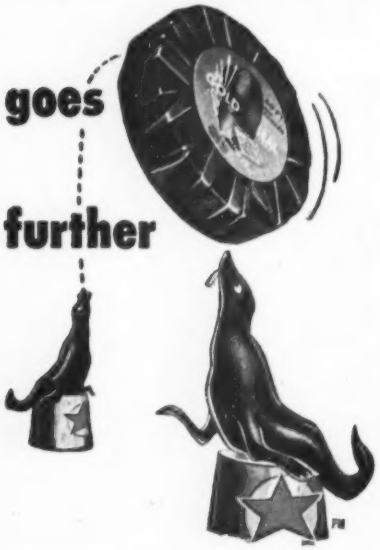
Rush full particulars on the G-E Water Cooler Plan.

NAME..... COMPANY.....

ADDRESS.....

CITY..... COUNTY..... STATE.....

Here's why JENKINS GOLD SEAL TAPE goes further



GUARANTEED FOOTAGE — you get full measure in every roll.

NO WASTE — Gold Seal Friction Tape tears evenly, does not ravel, conforms closely to uneven surfaces. Selected base cloth is made to high strength specification.

HIGH DIELECTRIC STRENGTH — Less footage is needed per job with Gold Seal Tape. No pinholes . . . one thickness insulates.

LASTING "TACK" — adhesive compound is prepared under laboratory control; this means that Gold Seal will stick to the job under severe conditions of cold and moisture.

EASY HANDLING — Gold Seal does not peel, dry out or smear the hands in hottest weather.

CELLOPHANE-WRAPPED — Keeps Gold Seal Tape factory-fresh until you're ready to use it.

PACKAGED FOR CONVENIENCE — In single rolls or handy 10-roll containers. It's the best buy in tapes. Jenkins Bros., (Rubber Division), 100 Park Ave., New York 17, New York.

JENKINS

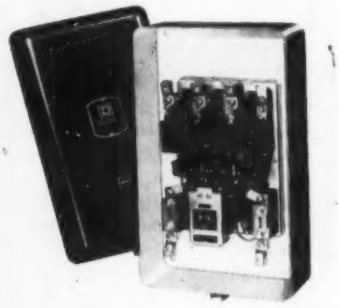
Gold Seal Tape

FRICTION . . . RUBBER

MADE BY JENKINS BROS. . . . MAKERS OF FAMOUS JENKINS VALVES

telephone conversations. The power supply, measuring 3 1/16-in. high by 4⅝-in long by 3⅞-in. wide, is plugged into any 110 volt outlet. Color-coded wires leading from power supply are attached to the telephones at their desired location. A new type of flat, ribbon-like wire which connects the phones can be run under carpets, or glued to walls, desks and baseboards. In a five phone installation, four push-buttons on each phone buzz each of the other four stations separately, although businesses needing as few as two, three or four phones would use only a corresponding number of the four calling buttons provided.

Connecticut Telephone & Electric Corp., Meriden, Conn.



Starter (31)

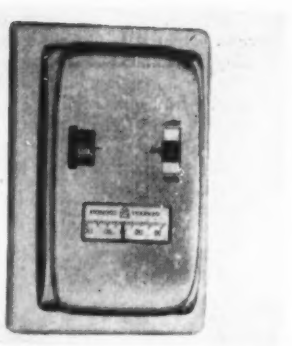
A new NEMA Size 4 vertical action starter is in production. With maximum polyphase ratings of 50-hp 220 volts, 100-hp 440-550 volts, the new starter is considerably smaller than the clapper type starter it replaces. Overall dimensions are 9¼-in. wide, 1¾-in. high and 7⅞-in. deep. Contacts used are silver and double-break. Armature has straight line motion, guided at top and bottom. All parts are front mounted for maximum accessibility in service and maintenance. All contacts may be inspected by removing arc chamber covers, and may be removed or replaced without disturbing line or load wiring. Eight electrical interlocks, 4 normally open and 4 normally closed, may be added to the starter, either at factory or after shipment. Interlocks are mounted on their own insulating base and can be fastened to starter with two screws.

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.

Transformer (32)

Transformers in sizes from 100 to 3000 kva and voltages to 15,000 volts are being designed for switchboard and switchgear equipment. Cores and coils are constructed with Class B and C heat-proof conditions. Insulation consists of Johns-Manville Quinterra, Quinglass, and DuPont's "Mylar" Polyester film. Coordinated insulation affords maximum protection against voltage surges. Provisions can be made for forced air cooling, which increases kva rating 33⅓%.

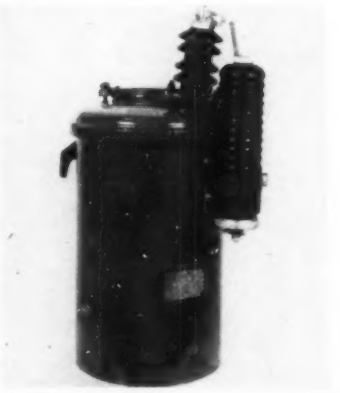
Marcus Transformer Co., 34 Montgomery St., Hillside 5, N. J.



Thermostat (33)

A new two-way thermostat, T-70H, for the dual purpose of controlling air conditioned temperatures in summer as well as warmth in winter. It is almost identical in room appearance with the company's flush-design winter weather thermostat, has a three-position switch with "Off", "Heat", and "Cool" settings. In cold weather, the "Heat" position regulates furnace output. In hot weather, the "Cool" position and temperature regulating dial signal room temperatures to air conditioning controls in new combined units. It reduces installation costs with a four-wire, low-voltage thermostat cable which connects with both heating and cooling controls in the new unit.

General Controls Company, Glendale, Calif.



Lightning Arrester (34)

A new "Magne-valve" lightning arrester, featuring small size and light weight. The new arrester, to be used for the present only on 7200- and 7620-volt unit-type distribution transformers, has impulse characteristics similar to those of the company's pellet arresters. For 7200-volt transformers, the 9-kv arrester is 14½-in. long and weighs 10 pounds. The 10-kv, for 7620-volt transformers, is 15½-in. long and weighs 11 pounds. It features Thyrite valve action augmented by magnetic action of internal series gaps. This permits application anywhere on system without regard to 60-cycle short-circuit currents. It also features an external gap.

General Electric Co., Schenectady 5, N. Y.

THE MAKERS OF THE WORLD-FAMOUS AMPROBE NOW BRING YOU THE

NEW AMPROBE JUNIOR

VOLT-AMP TESTER

ACTUAL SIZE

$19.85 INCLUDING VOLTAGE TEST LEADS

One pocket tester does the complete job

IT'S A SNAP-AROUND AMMETER

Measures current instantly without shutdowns or breaking of insulation for ammeter connections.

IT'S A VOLTAGE METER

Measures voltage quickly, accurately on a full-sized calibrated scale; eliminates guesswork.

Gives you tester ruggedness with instrument accuracy (within ± 3 % of full scale)

PICK THE RANGE THAT FITS THE JOB:

MODEL "10": 0- 10 AMPS A-C 0-125/250 VOLTS A-C
MODEL "25": 0- 25 AMPS A-C 0-125/250 VOLTS A-C
MODEL "50": 0- 50 AMPS A-C 0-125/250 VOLTS A-C
MODEL "100": 0-100 AMPS A-C 0-125/250 VOLTS A-C

Now every electrical man can be equipped with a snap-around volt-ammeter. The Amprobe Junior is similar to the world-famous Amprobe, except that it is built to fit a specific job at low cost. For only a few dollars more than just a voltage tester, you get an *accurate* voltage meter *and* a prized snap-around ammeter. Pays for itself the first month alone by eliminating guesswork and time-wasting connections. Write today for Catalog No. 132. Pyramid Instrument Corp., Lynbrook, N. Y. (Export Div.: 458 Broadway, N. Y. 13. Cable: Morhanex).

IF YOUR JOB CALLS FOR A MULTI-RANGE AMPROBE:

AMPROBE "300"

0-6/15/30/60/150/300 AMPS AC.
0-150/300/600 VOLTS AC.
$49.50 COMPLETE WITH LEATHER CASE AND VOLTAGE TEST LEADS.

AMPROBE "600"

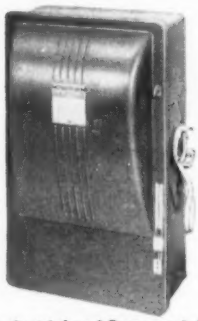
0-15/30/60/150/300/600 AMPS AC.
0-150/300/600 VOLTS AC.
$59.50 COMPLETE

AMPROBE "1200"

0-15/60/150/300/600/1200 AMPS AC.
0-150/300/600 VOLTS AC.
$67.50 COMPLETE

Best switch buy today—from any angle!

Heavy Duty
Industrial Applications



Industrial and Commercial
Applications—Type CA

Light Duty,
General Purpose

New *Life-Line* CA Switch gives greatest value today!

Meets NEMA Type A specifications at Type C prices

Now, in ONE great new switch, you can get the toughness, safety and lifetime performance of Westinghouse Type A quality switches in the price range of conventional Type C switches. The new CA licks the problem of matching economical first cost to service versatility in a broad range of commercial and industrial applications.

The CA is designed with a quick-make, quick-break, spring-operated mechanism. New interlock prevents opening of cover while switch is in "on" position. Horsepower rated, these switches can be used on inductive circuits.

Your biggest plus in the new CA is the protection, long service and basic economy of all Westinghouse switches—in the exclusives that conventional Type A switches cannot touch. Exclusive diamond-pointed breakjaw keeps arcing outside contact area, eliminates burning and beading, prolongs contact life. Exclusive one-piece copper construction of contact jaws, hinge jaws and terminals reduces heat power losses. Nowhere else can you get these and many other switch lifesaver benefits. Stack dollars against safety switch performance anywhere and, mechanically and electrically, you'll find Westinghouse switches the greatest value in a decade.

For extra tough applications demanding sheer strength and stamina, get the Westinghouse heavy duty Type A Switch.

See your Westinghouse Distributor. Have him demonstrate his full line of Westinghouse A, CA and D switches for NEMA Type 1 applications. Delivery—immediate. Write for new Booklet B-4723, Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-30164

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SEPTEMBER 29th to OCTOBER 2nd

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- see over 100 leading manufacturers' exhibits covering every phase of the industry

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Ilg Electric Ventilating Co.
Ilsco Copper Tube & Products, Inc.
Imperial Lighting Products Co.
International Register Co.
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Keystone Manufacturing Corp.
Kinney Electric Mfg. Co.
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Nilsh Tube Company
Natone, Inc.
Paragon Electric Co.
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Progress Mfg. Co.
Project Fixture Mfg. Corp.
Pryne-Rittenhouse Sales Corp.
Pyramid Instrument Corp.
Rab Elec. Mfg. Company
Rawlplug Company
Reel-O-Matic Corp. of America
Remington Arms Co.
Republic Steel
Revere Electric Mfg. Company
Rhode Island Insulated Wire Co., Inc.
J. R. Richards Company
Rodnie Mfg. Company, Inc.
Royal Electric Co., Inc.
The Ruby Co.
Sangamo Electric Co.
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8 WEST 40TH STREET, NEW YORK 18, N. Y. OXFORD 5-1563

Hair Dryer (35)

A new automatic electric hair dryer designed for use in gymnasiums and dormitories, athletic clubs, private and public swimming pools, stadium locker rooms and trailer parks. It dries the hair in three minutes after swim, shower or shampoo. Operated by a universal type 1/10 hp, 7500 rpm motor, it delivers 152 cubic feet of air per minute through a 2140 watt heating element. Actuated by a pushbutton, the dryer cuts off automatically after three minutes.

National Dryer Corp., 616 West Adams St., Chicago, Ill.

Motor (36)

A new single-phase motor that is both capacitor-start and capacitor-run. Called type CAP-2, motor is made in 5, 7½, and 10 hp ratings and is a 4 pole; 220 volt, 60 cycle motor. Auxiliary winding remains in circuit during operation and is in series with running capacitors. Relays remove starting capacitors when motor approaches full speed. Main winding is directly across the line. Where three-phase power is not available, this new design will permit use of larger single-phase motors for such applications as air conditioning units, oil-well pumping, and many farm jobs such as hay and grain drying, and feed grinding.

Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30, Pa.

Wall Plates (37)

A new line of wall plates for standard wiring devices. They are made of plastics, in both ivory and brown colors, and have a smooth-finished contour that eliminates all dust-catching grooves and patterns. The line includes single tumbler switch plates for one, two and three-gang installation; one-gang single and double convenience outlet plates; two-gang single tumbler switch and twin outlet plate; one-gang telephone and one-gang blank plates. The ivory plate line matches the company's remote-control wiring system wall plates.

General Electric Co., Bridgeport 2, Conn.

Product Briefs

(38) A new line of encapsulated **rectifiers** developed by the Seletron Div., Radio Receptor Co., Inc., New York, N. Y. . . . (39) A new curved plastic snap-on **louver,** called Lux-Grill, for single lamp fixtures, has been introduced by House-O-Lite Corp., Chicago, Ill. . . . (40) A new design feature of the Velocity-Power **Driver,** cartridge-actuated tool for setting studs in concrete or steel, is a permanently attached spall or protective shield. It is made by Velocity Power Tool Co., Pittsburgh, Pa.

(41) Lindell Electric Control Corp., New York, N. Y., has announced a new capacitor **indicator** . . . (42) A new white light **bulb** for use in portable table and floor lamps has been introduced by General Electric Company, Cleveland, Ohio . . . (43) Joy Manufacturing Co., St. Louis, Mo., has developed a cable **fault finder** for locating open-circuits or low and high resistance shorts of 10,000 ohms or less . . . (44) A two-way voice **communication system** for industrial use, linking "base stations" with mobile units such as cranes, ore bridges, yard locomotives and boat unloaders, has been developed by Mine Safety Appliances Co., Pittsburgh, Pa.

(45) Murray Company of Texas, Inc., Atlanta, Ga. has announced the addition of two new window **fans,** 16- and 30-inch . . . (46) International Business Machines Corp., New York, N. Y. has developed a new electronic portable **paging unit** for selective paging of "transient" personnel . . . (47) Anaconda Wire & Cable Co., Hastings-on-Hudson, N. Y. has developed a "solid" **TV line** good for all weather and all channels . . . (48) No. 556 combination **spot** or **flood-lite** is being produced by S & M Lamp Co., Los Angeles, Calif.

(49) A new self-contained 1,000 watt **electric plant** has been announced by Universal Motor Company, Oshkosh, Wis. . . . (50) British Industries Corp., New York, N. Y. has added a new AVO **coil winding machine** to its line. (51) Industrial Electrical Works, Omaha, Neb. has a new bracket-mounting **Port-O-Reel** . . . (52) "Super Slugger" new type **electric hammer** has improved design features. It is manufactured by Tempo Products Co., Cleveland, Ohio.

(53) The new model RM **thermal relay** made by the Electric Auto-Lite Company, Toledo, Ohio, is designed for eye level mounting . . . (54) Two new precision snap-action **switches,** designed for one-way actuation by cams, dogs or slides, have been announced by Micro, a division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. . . . (55) The Goldak Company, Glendale, Calif., has created a new **instrument** for locating conduit

Two of the MOST
PRACTICAL FANS
You've Ever Installed!

"Buffalo" BELTED VENT SET

This "Buffalo" Belted Vent Set is just the quiet, efficient fan you need for those store, theatre, restaurant and garage jobs. It's light and compact. Easy to mount on any solid framework, indoors or out. Those sheaves can be changed in a few minutes, any time you want more or less capacity. See the easy adjusting motor shelf for belt takeup. Same dynamic balance in its rotor that makes the biggest "Buffalo" Fans so vibrationless. Better write for Bulletin 3720 for details on this customer-pleaser!

The New "Diamond Jubilee" NV-BREEZO

Here's a fan you can install easily and get high-capacity, high-efficiency performance either on free air delivery or against ¼" to ½" system pressure! Its specially shaped 4-bladed wheel is the result of many years of developments by "Buffalo" engineers working on axial flow and propeller fans. Extremely sturdy, its blades are die-formed of # 16 ga. steel in the smallest sizes and # 12 ga. in the largest. The die-stamped panels are also heavy-gauge. The motor support, of strong, welded wire, is also a motor-side guard. Note the neat, attractive appearance. 8" to 24" sizes, for continuous removal of air, steam, heat, fumes. WRITE TODAY FOR NEW BULLETIN 3865. Here's a "natural" profit item!

"Buffalo" First For Fans

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The BEST is now BETTER than ever

THE NEW No. 420

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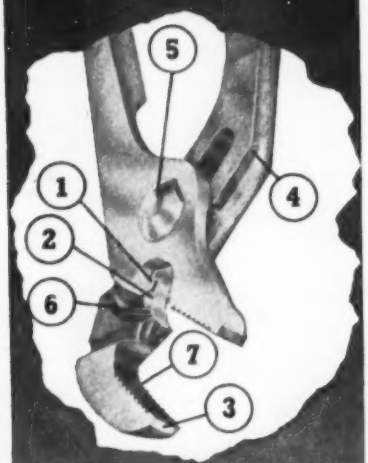

1. Interlocking principle prevents slipping under any load. 2. New type wide base lugs cannot shear. 3. New nose design for gripping small objects. 4. Patented design of tension edge eliminates stress concentration at channels. 5. New interlocking design minimizes stress on joint bolt. 6. Precision machined interlocking surfaces result in perfect fit, distributing pressure evenly. 7. "Rite Angle" teeth guarantee maximum bite and minimum wear.

Here is a plier that will last for years! Channellock Pliers—made only by Champion DeArment Tool Co., Meadville, Pa.

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or electrical outlet boxes, known as "Con-Let" . . . (56) Cable Electric Products, Inc., Providence, R. I. has introduced the new Switch-King line of residential **switches.**

(57) Two series of improved portable electric indicating **instruments** designed for maximum convenience and readability have been announced by General Electric Co., Schenectady, N. Y. . . . (58) The J. F. Hodgkins Company of Gardiner, Maine, has developed a new design of wire stringing **block,** known as the Kenneloy triple purpose block . . . (59) Talk-A-Phone Co., Chicago, Ill., has announced a new "wireless" two station **intercommunication system,** LC-33, that can be plugged into any electrical outlet . . . (60) A new expanded line of oil circuit **reclosers** with a one-way seal for moisture protection has been announced by General Electric Co., Schenectady, N. Y.

(61) Curtis Development & Manufacturing Co., Milwaukee, Wis., has designed a metal enclosure for "M" or "MT" **terminal blocks** . . . (62) Marvin Manufacturing Co., Los Angeles, Calif., has introduced the V8 **ventilating fan** . . . (63) The new Type 915 Barrymount is a vibration and noise **isolator** designed for high-speed machinery. It is made by The Barry Corp., Watertown, Mass. . . . (64) A new **lever control** for variable speed motors has been developed for Varidrive motors by U. S. Electrical Motors, Inc., Los Angeles, Calif.

(65) General Electric Co., Schenectady, N. Y., has announced new distribution-transformer **connectors** that permit use of either aluminum or copper conductors . . . (66) Appleton Electric Company, Chicago, Ill. has announced a new utility **wrench,** combining de-burring and non-slip features . . . (67) Model 4 **transmitter** and dc proof **tester** was designed primarily for use on lead covered cable installed in ducts, but can also be used on aerial and buried cable . . . (68) Fractional horsepower Varidrive **motors** in combination with right-angle Syncrogears are available from U. S. Electrical Motors Inc., Los Angeles, Calif.

(69) A new synchronous-precision **control** for resistance welding of hard-to-weld metals has been announced by General Electric Co., Schenectady, N. Y. . . . (70) The Microsyn position **indicator** is a small electromechanical signal generator which transforms angular displacement into an electrical signal for measurement of any mechanical variable. It is made by Dolecam Corporation, Soldiers Field Road, Boston 35, Mass. . . . (71) A new 25-watt **amplifier,** Model 3725-B, has been announced by Bell Sound Systems, Inc., Columbus, Ohio . . . (72) United States Petroleum Co. of Clifton, N. J., has introduced a new automatic bearing **oiler** called the Milos automatic bearing oiler.

(73) A new convenience and safety idea in **pliers** is the "cushion throat" now being introduced by Utica Drop Forge & Tool Corp., Utica, N. Y. . . . (74) A new series of **Safety Solvents** for cleaning greasy, oily, dirty machine parts has been developed by Harco Chemical Co., Cranford, N. J. . . . (75) A new line of L-P **fire pots** and **torches** has been announced by the Turner Brass Works, Sycamore, Ill. . . . (76) A new controlled cut, carbide tipped Meyco safety **saw** has been placed on the market by the W. F. Meyers Company, Inc., Bedford, Ind.

(77) United States Electrical Tool Div., Emerson Electric Mfg. Co., St. Louis, Mo. has introduced a ¼-inch ball-bearing **electric drill** . . . (78) Williams Electric Co., Portland, Ore. has developed the "Williams Close-Quarter **Bit"** sets, which are available in two sizes, 1-in. and 12/16-in. . . . (79) A new line of adjustable torque-limiting **clutches** that provide overload protection for machine drives in a wide variety of equipment has been announced by Morse Chain Company, Detroit, Mich. . . . (80) A formed **metal trade** of new design increases safe footing on Ballymore ladders and work platforms. Manufactured by Ballymore Company, Wayne, Pa.

(81) A "Push-A-Bout" **step ladder** has been added to the Jiffy line by Clyde W. Lint, Chicago, Ill. . . . (82) Electric Machinery Mfg. Co., Minneapolis, Minn. has announced the production of flywheel **motor generator** sets for microwave system power supply . . . (83) A new **line trap,** Type M, with a continuous current rating of 1200 amperes is available from the Westinghouse Electric Corp., Pittsburgh, Pa. . . . (84) American Pipe Bending Machine Co. of Poultney, Vt., has added a **pipe bending machine,** Type 2PBR, to its line.

(85) A new linear proportional **solenoid** designed and developed by the Connecticut Telephone & Electric Corp., Meriden, Conn., to exacting specifications for jet aircraft fuel control systems is now available for other commercial and military uses . . . (86) New **coding markers** for small gage wire have been developed by the Westline Products Div., Western Lithograph Co., Los Angeles, Calif. . . . (87) New large-size plastic **wall plates,** called Sierra jumbo-plates and designed to conceal wall damage where electric outlets and switches are installed, are now being marketed by the Sierra Electric and Manufacturing Company of Los Angeles, Calif. . . . (88) A new type of **magnet wire,** Roetemp, is for use primarily in dry-type transformers. It is manufactured by John A. Roebling's Sons Corp., Trenton 2, N. J.

(89) A new food waste **disposer** sized to fit 90% of existing sinks without **alteration** of drain connections, has been announced by General Electric Co., Louisville, Ky.

Model 622 – Ultra-Sensitive Instruments

Portable d-c and a-c thermo instruments for precision measurement of potentials and minute currents in electronics or laboratory research.

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Portable Test Instruments

Available in d-c, Model 901 —and a-c, Model 904, single and multiple ranges of wide coverage. Excellent scale readability and shielding. Accuracy within ½ of 1%.

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Sensitive Relays

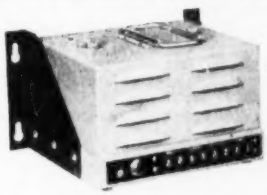
A line of sensitive relays including the Model 705 which provides positive operation at levels as low as ½ microampere. Non-chattering magnetic contacts handle up to 10 watts at 120 volts.

Panel and Switchboard Instruments

A complete line of instruments in all types, sizes and ranges required for switchboard and panel needs . . . including d-c, a-c power frequencies and radio frequency, rectifier types and D.B. meters.

Model 697 Volt-Ohm-Milliammeter

One of a line of pocket-size meters, Model 697 combines a selection of a-c and d-c current, and resistance ranges. Ideal for maintenance testing and many inspection requirements.



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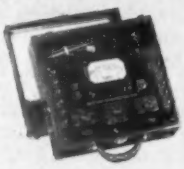
Stable amplifier provides high degree of resolution even at fractional loads. Reaches steady full scale deflection in a fraction of a second. Interchangeable plug-in range standards for either microamperes or millivolts.



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A multi-range, multi-purpose, ultra-sensitive analyzer, for laboratory and industrial checking of electrical and electronic circuits. Has 28 practical scale ranges; measures d-c and a-c voltage, d-c and a-c current, and resistance. Accessories available to extend ranges. Compact and portable; furnished in either oak or steel case.

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Tests tubes under exact operating potentials. Accurately determines true mutual conductance of all tubes, In accordance with manufacturers' rated operating conditions, or under special operating conditions.

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A three-in-one instrument providing a self-contained Volt-Ohm-Milliammeter, a high impedance electronic D-C Volt-Ohmmeter, and a probe type Vacuum Tube Voltmeter for use to 300 megacycles. Exceptionally stable and accurate. Has specially designed extremely small RF and D-C probes.

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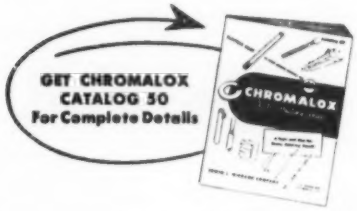

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Catalogs, Bulletins and Engineering Data

(90) AUTOMATIC CONTROLS for domestic oil burners; photographs, dimensioned sketches, ratings, specifications and complete descriptions of room thermostats, time switches, master controls, flame detectors, warm air limits, hot water limits, steam limits and transformer relays. 22-page, two-color bulletin. General Electric Co.

(91) FLUORESCENT FIXTURES for operation across 480-volt power lines; designed for mounting end to end in even multiples of 2 feet in surface, recessed or suspended applications, with or without reflectors, using slimline lamps; photographs illustrate connection boxes on which lamp holders and ballast components mount. 4-page bulletin. Wac Engineering Co.

(92) ALUMINUM POLES for street lighting: application, construction features, specifications, modifications and accessories for types of poles available; diagrams show salient features of poles and mast arms; pictures and descriptions of luminaires for applications from residential streets to high-speed superhighways. General Electric Co.

(93) LIGHT DIMMER to replace the light switch in a wall provides complete lighting control from blackout to full brightness; drawings and descriptions of residential applications. Two 4-page bulletins. Superior Electric Co.

(94) ELECTRICAL-METALLIC TUBING, colored for circuit identification; description of E.M.T. containing four lines of the same color—red, blue, yellow or black—spaced 90° apart and running the full length of the tube. 4-page bulletin. Nikoh Tube Company.

(95) ELECTRICAL TAPE and insulation putty; table showing physical and electrical properties; description of applications for padding, insulating and protecting cable splices, split-bolt connectors, bus bars and other irregular surfaces and sharp edges. Minnesota Mining and Manufacturing Co.

(96) ALUMINUM CONNECTIONS; cartoons describing five rules for making proper connections, including aluminum-to-copper, especially in distribution lines and service drops—based on approved technical principles. 20-page booklet designed as educational and training aid. Kaiser Aluminum & Chemical Sales, Inc.

(97) PUSHBUTTONS of oil-tight design; photographs and drawings illustrating types of units and switches available, color ring identification and building-block construction of contact units. 8-page bulletin. General Electric Co.

(98) MOTOR STARTERS, manual and magnetic, combination and reversing, and pushbutton control stations in three types of enclosures: general purpose, water- and dust-tight hazardous gas and dust type, and open type; table shows motor voltage and motor maximum hp (3 phase) applicable to each of the four NEMA sizes (0 to 3) described. 8-page bulletin. Allis-Chalmers Mfg. Co.

(99) HEATING CONTROLS for furnaces, ovens, dryers and kilns including electronic potentiometer and millivoltmeter type pyrometer controllers, recorders and indicators; photographs, complete engineering specifications and prices, diagrams of control arrangements and dimension sketches. Catalog No. P1255. The Bristol Co.

(100) ELECTRIC MOTORS, generators and motor-generator sets; detailed information on performance, dimensional data, construction advantages, installation; charts to aid in the selection of polyphase squirrel-cage induction motors for ordinary applications; electrical and mechanical modifications that are available for particular installation needs. 12-page catalog. General Dynamics Corp.

(101) CONTROL CENTERS for mounting of motor starters with circuit breaker disconnect; starters through NEMA size 4 plug into vertical main buses; description of housing, motor starters, circuit breakers, engineering and layout data; ratings and dimensions of plug-in units; typical control center installations. 16-page bulletin. Federal Electric Products Co.

(102) LIGHTING FIXTURES of metal, plastic or combinations of each for residential use; drawings, dimensions, descriptions and price list. 4-page bulletin. Markel Electric Products, Inc.

(103) TEST CLAMPS for making electrical connections to terminals, bus bars, meters, etc.; for insuring tight contact of fuses and fuse clips; for

BIDDLE
Instrument News

- ELECTRICAL TESTING INSTRUMENTS
- SPEED MEASURING INSTRUMENTS
- LABORATORY & SCIENTIFIC EQUIPMENT

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MAKE PRECAUTIONARY CONDUCTIVITY TESTS
with the MIDGET MEGGER® FLOOR TESTER KIT

In dust filled rooms or where inflammable gas accumulates there is danger of explosion. One of the most insidious causes is the presence of static electricity. The average hospital anesthetizing area is a typically vulnerable example.

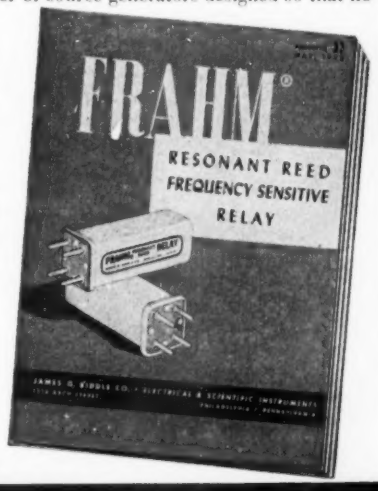
The Midget Megger Floor Tester Kit was developed especially for testing the conductivity of floors and equipment in areas where explosion hazards exist. This kit is offered for use in compliance with that portion of the National Fire Protection Association's Bulletin NFPA #56, "Recommended Safe Practice for Hospital Operating Rooms", for tests to determine whether the resistances are within safe limits.

We invite your correspondence on problems of static electricity and explosion hazards. Send also for **BULLETIN 21-752-ECM.**

FRAHM® FREQUENCY SENSITIVE RELAYS
Resonant Reed Design Simplifies Transmission of a Number of Control Signals Over a Single Circuit

Each carbon-steel or alloy reed is tuned to vibrate to a signal frequency within a narrow range. Several Frahm Resonant Reed Relays may be operated simultaneously on a single control circuit by employing an equal number of source generators designed so that no operating frequencies overlap. In the 200-500 cycle range 16 channels can be used on one circuit without interference. Frahm Relays may be used with all types of communication circuits including radio and carrier systems as well as wire circuits.

When proper signal is applied, Frahm Relay responds after a few cycles by closing its contacts for a fraction of each cycle. Auxiliary relay may be used for steady closed contact. Specials are available. Frahm Relays are built with nominal frequencies between 50 and 500 cycles; may be operated at any level between 20 and 200 ampere-turns.



Your correspondence is invited. For detailed characteristics, ratings, etc. of Frahm Relays send for **BULLETIN 33-ECM.**

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Select One or More of These MEGGER® INSTRUMENTS

1. Midget Megger Circuit Testing Ohmmeter—measures down to .1 ohm. Battery supply.
2. Bridge-Meg Resistance Tester—Measures down to .01 ohm. Hand generator operated.
3. Megger Low Resistance Ohmmeter—measures down to .000010 and .000100 ohms. Either battery or rectifier operated.
4. Ducter® Low Resistance Ohmmeter—measures down to .000001 ohm. Battery or rectifier operated.

All these instruments are portable, rugged field instruments that give long, trouble-free service. They are simple to use and, of course, embody the utmost reliability that is always associated with the Megger trade name. For checking circuit continuity, measuring the resistance of switch contacts in microhms—for laboratory, production line, or out-in-field trouble-shooting. Every electrical man should have one or more of these Megger instruments available. Send for **BULLETIN 24PI-ECM.**

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Between Links and Knife Blades

COOLER OPERATING

WARE Hi-Lag FUSES

Prevent Needless Blows Due to Loose Contact

Every electrician knows whenever a solderless connection is made . . . that tight contact must always be assured. Among renewable fuses, only WARE Hi-Lag provides a never loosening *vise-like* grip between links and knife blades. Link ends are bracketed in double surface contact in WARE Hi-Lag's exclusive design.

Extra wide spring tension washers grip entire link-end assembly in a never-loosening grip. Extra wide WARE FUSE link ends fully match the width of knife blades and distribute current flow and heat over a wider area. Links stay cooler and absorb sudden surges easier.

FULL COVERAGE
Extra wide link ends match width of knife blades assuring even distribution of heat and current flow. Operates cooler longer.

SPRING TENSION WASHERS NEVER LOSE GRIP
Square Design Grips Overall Width of Link

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Lower Your Costs
Give Full Protection
Speed Production

VISE-LIKE GRIP LOCKS LINKS IN CIRCUIT
Vise-Like Bracket
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Extra Wide Spring Tension Lock Washers
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WARE fuse engineering dates to 1915. Now WARE is internationally accepted for best protection and performance.
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locking knife switch blades. Leaflet describes uses. Trico Fuse Mfg. Co.

(104) TOGGLE SWITCHES and assemblies; descriptions, photographs, drawings and tables give uses, dimensions, electrical ratings and current carrying capacities; multiple-unit assemblies permit switching of from 4 to 12 single-pole, double-throw circuits with a single toggle lever. 8-page bulletin. Minneapolis-Honeywell Regulator Co.

(105) ELECTRICAL FITTINGS including connectors for solderless wire splicing and terminating, insulated bushings for electrical metallic conduit, plugs for knockout holes, and heavy-duty molded terminal blocks; includes complete specifications, dimensional data, application instructions and ordering information. 16-page bulletin. Buchanan Electrical Products Corp.

(106) PLUG-IN BUS DUCT; complete information on features and uses; samples of layouts illustrating way in which plug-in fittings are used to simplify installation. Bulldog Electric Products Co.

(107) STEEL FRAMING for mounting and supporting electrical equipment and fluorescent lights, or for building storage racks, tables and benches; photographs, diagrams and description of uses and assembly. 4-page bulletin. American Steel and Iron Works.

(108) EXPLOSION-PROOF FITTINGS and fixtures for hospital operating rooms; description of wiring devices, installation methods and types of explosion-proof condulets for use in protecting electrical outlets, switches and other fixtures from the explosive effects of anesthetic gases or liquids. 28-page illustrated bulletin. Crouse-Hinds Co.

(109) PANELBOARDS and switch units; complete descriptive material, dimensional data, horsepower ratings and method of operation of units rated up to 50 hp at 250 or 575 volts, single- or three-phase, 4-wire. 12-page bulletin. Bulldog Electric Products Co.

(110) PORTABLE POWER TOOLS; descriptions and illustrations of electromagnetic hammers and hammer drills, electric drills, screwdrivers, nut runners, polishers, sanders, grinders, electrical impact wrench, hammer paving breakers, rock drills and concrete vibrators. 30-page catalog. Syntron Co.

(111) SCAFFOLD TOWERS of tubular steel rolling construction for all types of electrical maintenance or construction work; detailed description of method of locking braces to panels and panels on panels with self-contained locks. Descriptive Folder No. 52. Advance Scaffold Div., Beaver Art Metal Corp.

(112) VENTILATING FANS for attics and windows; descriptions and tabu-

lated specifications for each model with fully-illustrated, step-by-step installation instructions. H. C. Biglin Co.

(113) SIGNAL GENERATOR position indicator for servo systems used in the control of industrial processes in the chemical, refinery and allied industries; tabular data, photographs and diagrams illustrate characteristics and uses. Doelcam Corp.

(114) TERMINAL BLOCKS of molded construction; modular terminal units plus locking strip permit assembly of block containing any desired number of terminals; drawings illustrate construction and assembly. Ilsco Copper Tube and Products.

(115) CABLE FAULT LOCATORS and dc proof testers for use on lead-covered cable in ducts, aerial cable and buried cable; description of common faults with instructions for their detection. 12-page, illustrated bulletin. James G. Biddle Co.

(116) V-BELTS for industrial power transmission with new increased horsepower ratings approved by Rubber Manufacturers Association; contains length correction and small diameter factor for use in designing a V-belt drive plus new revised drive tables for quick calculation. Durkee-Atwood Co.

(117) FRICTION CLUTCHES of torque-limiting slip type which provide overload protection for variety of machine drives; includes dimensions and capacities of standard 4½, 5½ and 6½-inch diameter adjustable clutches. Data sheet punched for 3-ring binder. Morse Chain Co.

(118) HAND TACHOMETERS of non-magnetic construction, individually calibrated with hand-drawn scales for accuracy; instructions for use and drawings of scales to show standard range combinations. Herman H. Sticht Co.

(119) INDUSTRIAL BELTING for power transmission, conveyors and elevators; tables, charts and diagrams record every phase of belting; general information questions answered in simple language. 48-page technical manual. Boston Woven Hose & Rubber Co.

(120) IDENTIFICATION CHART for electronic wire and cable to permit positive correlation of wire products from a vague general description. 28-page catalog. Alpha Wire Corp.

(121) DROPOUT CUTOUTS, open type, including load-break cutout, control-vented cutout, and single- or double-vented cutout with standard or bayonet head for hookstick operation; photographs, dimensioned drawings and tables provide characteristics and ratings. 16-page bulletin. Southern States Equipment Corp.

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NOZZLES AND FLOOR BOX ACCESSORIES

FLOOR JUNCTION BOXES

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CABLE CLIPS

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FISH WIRE

"Latrobe" Floor Boxes and Wiring Specialties are designed for quick, easy installation and superior performance. Stripped of frills and complex assembly, "Latrobe" Products do their job smoothly and economically.

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Unique, practical design cuts installation time; makes safer job and leaves more wire space inside box. Cover Plate is 3½" diameter.

Keystone Fish Wire

Ten sizes — from lightest work to heaviest power wiring. 100, 150, and 200 foot coils.

Insulator Supports

Fasten porcelain or glass insulators to steel framework without punching holes. 4 sizes —1", 1½", 2" and 2½".

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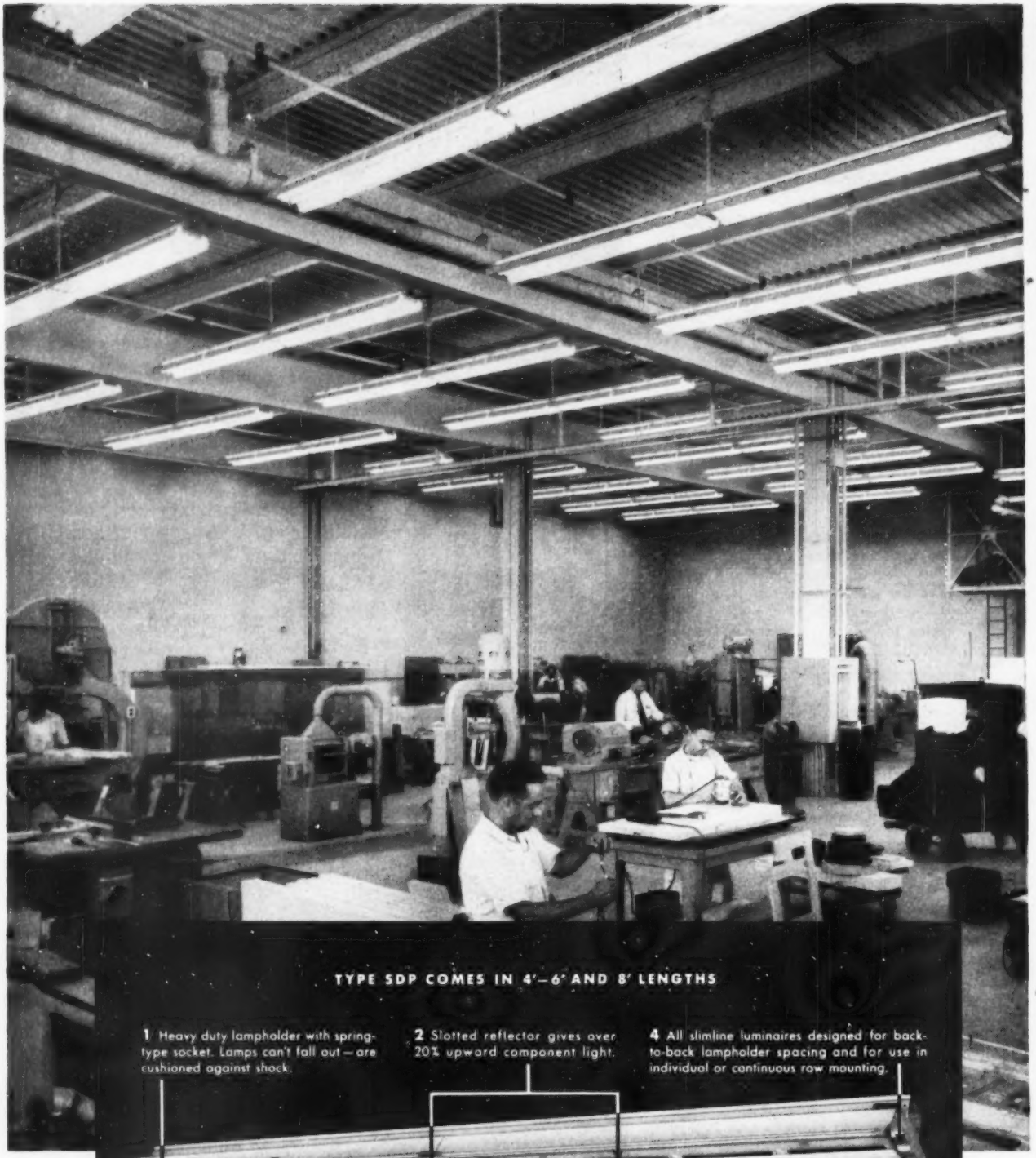

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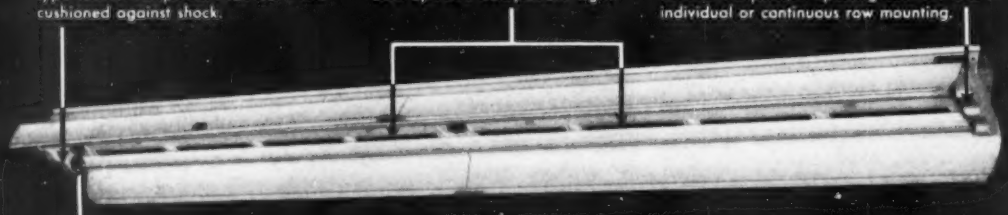
1 Heavy duty lampholder with spring-type socket. Lamps can't fall out—are cushioned against shock.

2 Slotted reflector gives over 20% upward component light.

4 All slimline luminaires designed for back-to-back lampholder spacing and for use in individual or continuous row mounting.



3 Large, easy-to-grip wing nut makes reflector removal easier.

The entire line of slimline fixtures uses the new Westinghouse Lead-Lag Ballast—for dependable and economical lamp operation.

Over 20% upward light provides quality illumination at Norton Company

New Westinghouse Type 2SDP-75 helps remove shadows...improves safety and work quality

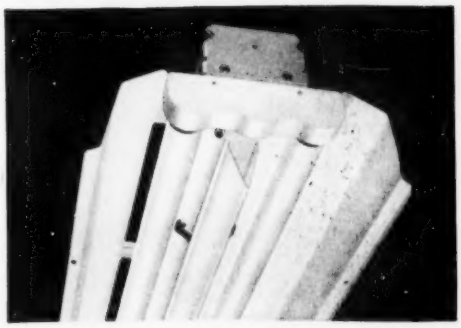
Where high-quality production depends on critical seeing, semidirect lighting makes good sense. It makes possible more comfortable light at higher illumination levels.

In the Norton Company's Grinding Machine Division, over 2200 Westinghouse SDP's help provide light for better work in their new $6,000,000 plant addition . . . the largest industrial semidirect lighting system in the world.

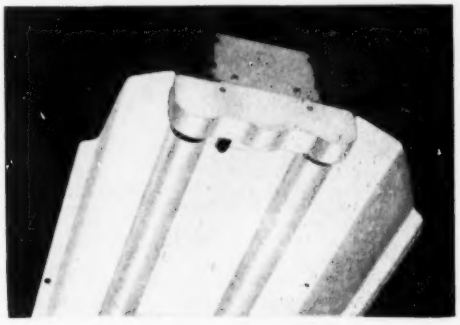
The new Westinghouse SDP luminaire provides 22% upward component of lighting. The white ceiling, therefore, becomes a part of the lighting system—a low brightness source covering a large area. Shadows and uncomfortable brightness reflections disappear. This is the kind of lighting that industry needs and wants.

Modernize or build anew with light for better work

This is only one example of what can be done with light for better work. Westinghouse has a wide variety of specially designed luminaires for this and other industrial lighting problems. Why not see your Westinghouse distributor today and get the complete story? Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-04337



Type SDPS (with additional shield) provides 27-degree shielding when luminaires are mounted low to working surface.



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SORGEL AIR-COOLED Dry-Type TRANSFORMERS

Accepted Quality

Complete Line

¼ Kva to 1500 Kva single phase.
1 Kva to 3000 Kva 3-phase, 2-phase, and phase changing.
All voltages, 120 up to 15,000 volts.

Accepted by Engineers, Contractors, U. S. Government, as Time-Tested and Top Quality

SORGEL dry-type transformers are preferred because of their cost-saving features and years of dependable service.

- √ **Easy installation**— Attached mounting brackets.
- √ **Easy connecting**—Connection compartment with solderless Terminals.
- √ **Rugged construction.**
- √ **Liberal design.**
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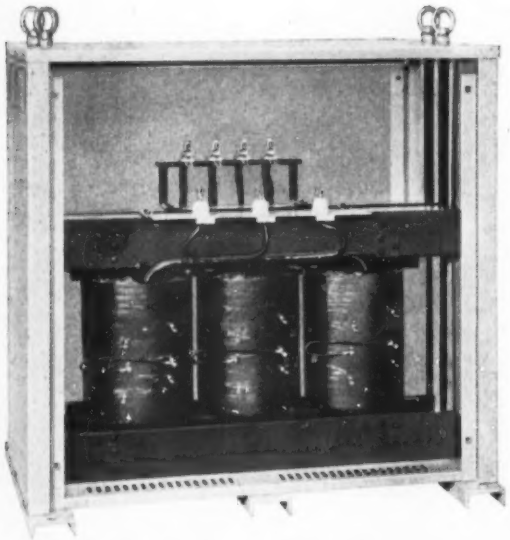
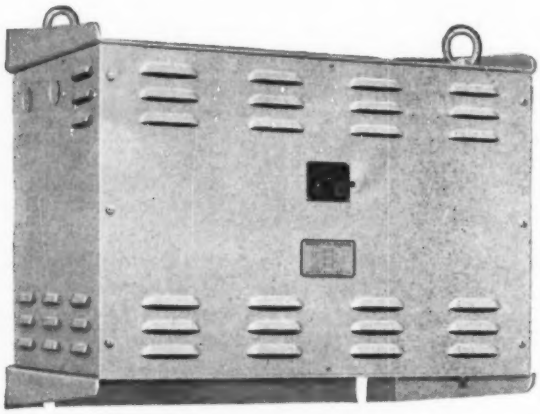
¼ Kva single phase 480/240 to 240/120 volts



300 Kva 3-phase 2400 volt transformer.

This view of the transformer with the panel of the connection compartment removed shows terminals of solderless lugs for cable connections and tap changing connections. Primary or secondary may enter at either end or both in the same end. The transformer can also be arranged to have the primary enter through the bottom and the secondary can be bus bar extending through the end of the enclosure.



20 to 50 Kva 3-phase. Wall mounting type

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Reader's Quiz

Movement of Overhead Lines

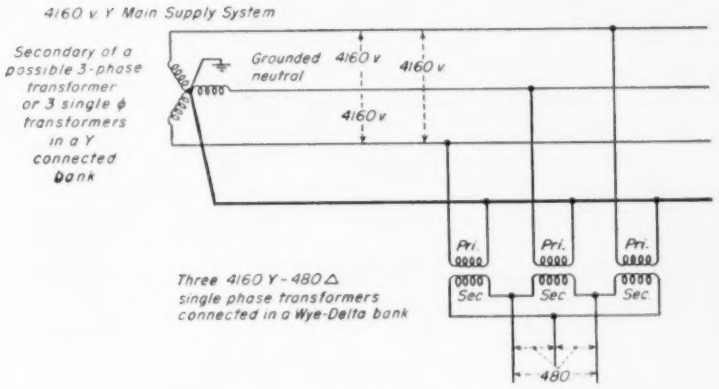
QUESTION P23—Why would high voltage lines continue to move up and down under certain weather conditions? This occurred only between one pole span. The rest of the line remained absolutely still. This condition continued for several hours.—E.S.H.

ANSWER TO P23—High tension electrical transmission lines have been observed under certain weather conditions to vibrate with great amplitudes and at a very slow frequency. The lines consist of a wire, of more or less circular cross section, stretched between towers about 300 feet apart. A span of the line will vibrate as a half-wave with an amplitude as great as 10 feet in the center and at a rate of one cycle per second or slower. On account of this character, this phenomenon is hardly ever described as a vibration but is commonly known as "galloping". It has never been observed in countries with a warm climate but it occurs about once every winter in Northern States and Canada when the temperature hovers around 32 degrees Fahrenheit and when a rather strong transverse wind is blowing. In most cases sleet is found on the wire. A rough calculation shows that the natural frequency of the span is of the same order as the observed frequency. The fact that, once started, the disturbance is very persistent and continues sometimes for 24 hours with great violence, makes an explanation on the basis of "forced" vibration quite improbable. Such an explanation would imply gust in the wind having a frequency equal to the natural frequency of the line to a miraculous degree of precision.

We have a case of self-excited vibration caused by the wind acting on the wire which, on account of the accumulated sleet, has taken a non-circular cross section. The explanation involves some elementary aerodynamic reasoning.—O.C.

Grounding Y Connected Transformers

QUESTION Q23—We plan to change our 2400 volt delta connected system to 4160 volt Y system. Is there any advantage in running the neutral of the main supply bank to each primary of the 4160 to 480 volts Y-D transformers? No lighting transformers are used in this section.—M.D.



ANSWER TO Q23—Three-phase, four wire grounded neutral systems are made so that 3-phase power circuits and single phase lighting circuits can be connected to the same system.

An appreciable savings in copper is realized in utilizing a 4 wire, 3 phase system for power and lighting circuits.

Because no lighting transformers are to be fed from this newly connected 4160 wye system, there is no definite advantage in running a neutral conductor from the main bank to each primary of the 4160 wye to 480 delta power circuit transformers.

If the neutral of the main supply bank is grounded, then for purely safety reasons the grounded neutral should be carried through to the *common primary connection* of the 4160 Y-480 delta transformer bank, thereby establishing a very secure ground. The sketch shows these banks grounded.—R.A.M.

ANSWER TO Q23—There is no advantage in running the neutral of the main supply bank to each of the primaries of the 4160 to 480 volts wye-delta transformers. In fact, it is undesirable to do so for three significant reasons:

1. If one phase of the power supply to the wye-delta bank becomes open, the three phase bank operates as an open wye, open delta bank, and three phase power is continued to be supplied on the low voltage side. Assuming the bank normally carries 100% load, then with the above condition it continues to carry full load on only two windings, resulting in a 73% overload on the bank. If normal fusing is practiced this condition will not blow the fuse, but will burn up the transformer if continued.

2. The wye-delta bank will try to act as a grounding bank in the event of a fault in some other part of the system. This may also cause the transformer to burn out.

3. An unbalance between phases causes currents to flow in other wye-delta transformers connected to the same line.

It should be pointed out that with the change proposed it is necessary to ground the neutral of the 4160 volt wye secondary of the supply transformer solidly. This is necessary because equipment connected to the system is insulated for 2300 volts and probably would not withstand the higher voltages which might result from the displacement of the neutral of the 4160 volt wye ungrounded system. Relatively high ground fault currents will result from solid grounding. —L.J.C.

Locating a Faulty Ground

QUESTION R23—We have a portable dc welder, 300 ampere size which is driven by a 3 phase, 440 volt ac motor. The line to this 3 phase motor is a 312, 4 wire rubber cord. Occasionally the fourth wire, which is the

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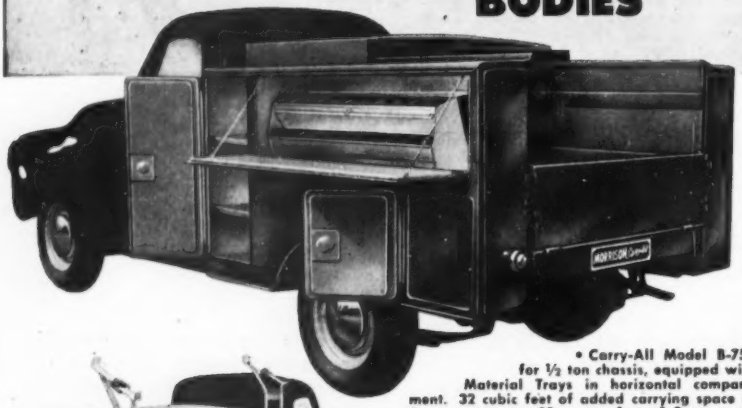

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equipment ground, gets very hot and burns the rubber insulation off.

Can any readers tell us why this ground wire burns.—H.W.

ANSWER TO R23—Obviously, the ground wire must carry current when it gets hot and the first step is to find out whether it carries alternating or direct current. If ac, something is wrong with the motor. If dc, it must be the welding current which normally should flow through the electrode leads. Therefore, one can suspect a faulty (high resistance) connection in the welding lead which is at ground potential. This is the more likely because the fault is intermittent.—L.F.R.

ANSWER TO R23—H.W. has a ground in his welding machine, which should be removed as quickly as possible in the interests of safety. This ground could be in either the ac induction motor or in the dc generator. A ground in the motor would cause current to flow through the machine frame and grounding wire to either the ac system ground or to an accidental ground on another phase; a ground in the generator would cause a fault current to flow through the machine grounding wire to the welding ground on the work.

Direct current generators are more likely to develop grounds than induction motors, so H.W. would do well to check here first. The fact that the ground wire carries a heavy enough current to melt the insulation, yet does not blow the ac line fuses or trip the motor overloads, also indicates trouble on the dc end. A Megger or ohmmeter will reveal the ground quickly, but lacking these, a close visual inspection will possibly locate the fault. Blow the machine thoroughly to clean out all loose carbon dust and dirt, then check brush rigging, pigtails, field coils and leads, and other motor wiring for signs of poor insulation or signs of arcing. Should this fail to locate the trouble, it will be necessary to consult a reliable motor repair shop. —D.H.N.

Automatic Plugging Device

QUESTION S23—We recently purchased a milling machine on which was mounted an automatic plugging device. The motor is 220/440 volt, 15 hp, 3 phase, 60 cycle ac, being run on 220 volts. The plugging device is connected electrically to T1 and T4 of the motor leads, and there are no mechanical connections from the device to the machine. However, when the motor gets down to a safe speed when stop-

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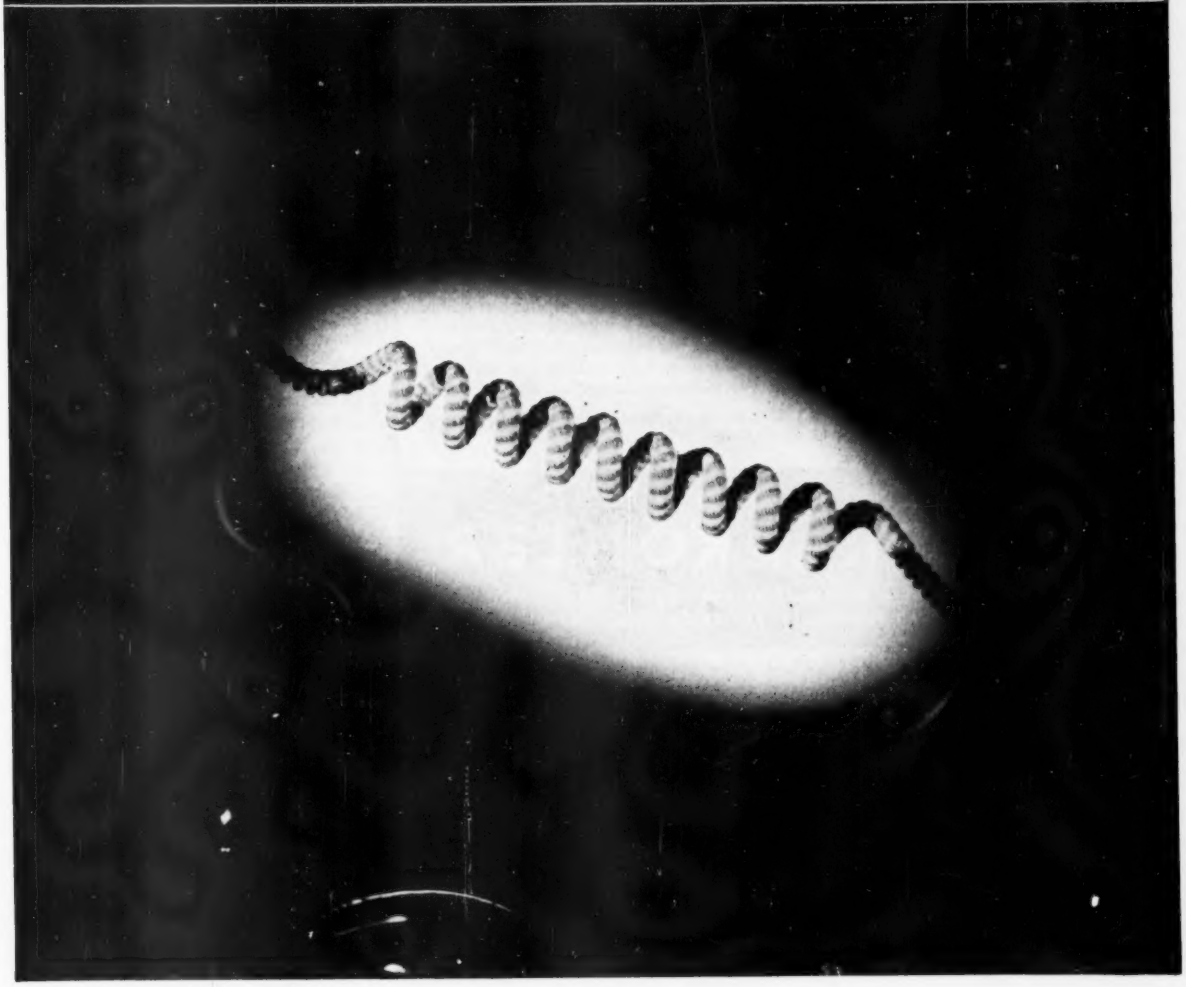

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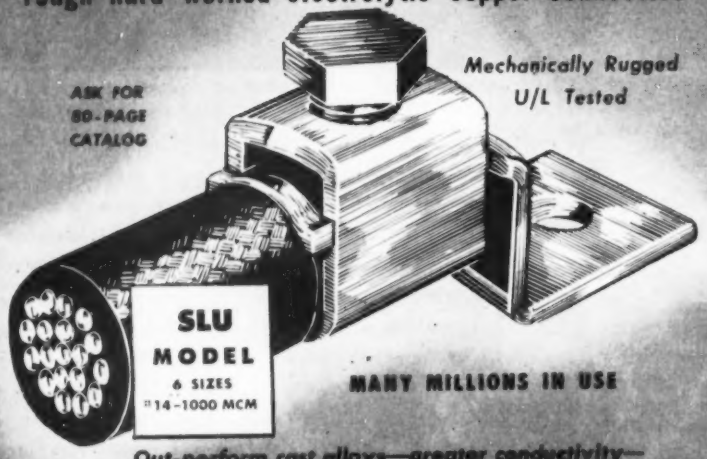

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ping, the relays in this device throw in a plugging contactor and stop the motor. What is the principle of operation of this device?—S.R.U.

ANSWER TO S23—The relay in the plugging device is evidently connected across the motor leads so that when the line to the motor is disconnected and the generated voltage drops to a set rating the relay opens and closes a contact which actuates the plugging contactor and throws a resistance across the motor leads—in this case the ac windings with the line voltage removed. The magnetic flux from the rotating field magnets generates a voltage in the ac windings which causes a heavy current to flow and the motor is then a generator, well loaded. The load which in this case is the resistors quickly brings the motor to a stop.—L.J.B.

ANSWER TO S23—First of all, in milling machines used in many factories, it is very necessary to decelerate a machine as rapidly as possible to eliminate as much lost time as possible, when changing settings or operations.

The principle of operation of these plugging switches is this:

Switches operate on the eddy current brake principle. When a machine is started, and the plugging switch attains a speed close to 30 rpm the plugging switch contact closes.

When the machine is stopped the line contactor opens, and at the same time closes the reversing contactor which decelerates the motor to the speed the plugging switch is set for. Then the plugging switch contact opens, and the motor coasts to a standstill.

Here is another use for these plugging switches. We have them installed on all tail pulleys of our belts. When a belt stops, it automatically stops the machine feeding it.—L.A.H.

Can You ANSWER these QUESTIONS?

QUESTION C24—An account of ours has a Myers water pump with a 12-inch stroke belt driven by a 5 hp single phase repulsion induction motor.

The pump works hard and causes the brushes on the motor to wear down fast. The motor will not start, but hums very loudly.

The magnetic starter is in good condition and with a 28.0 heater will not disconnect the power.

The motor hums for hours, gets very hot and the owner does not know about it till he finds he has no water.

Also in case of low voltage we find magnetic starters do not protect mo-

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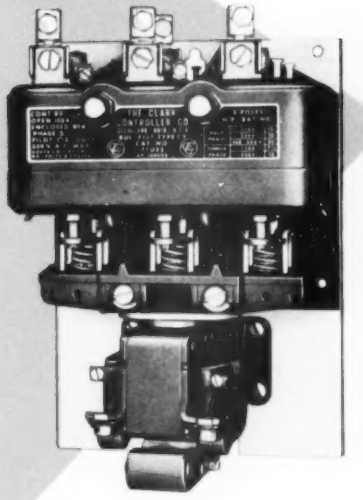
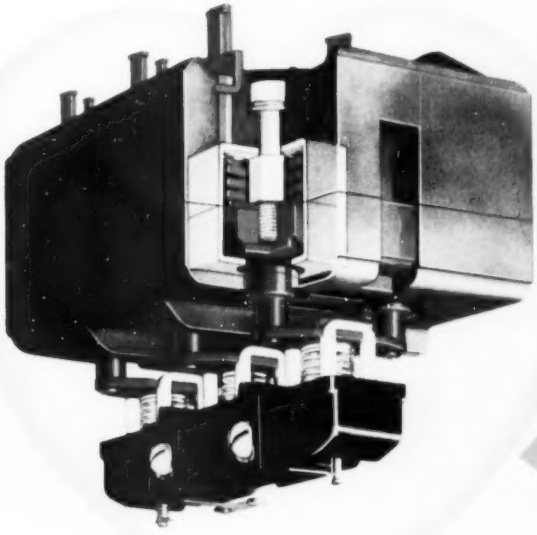


NON-REVERSING SIZE 2
TYPE "CY" STARTER
OPEN TYPE



THE WORKING HEART OF THE CLARK TYPE "CY" STARTER

Cut-away view showing magnetic circuit, arc shield and blow-out coil. The top of the Arc Chamber is closed. This prevents accumulation of ionized gases between wiring terminals. Phase to Phase failures are thus minimized.

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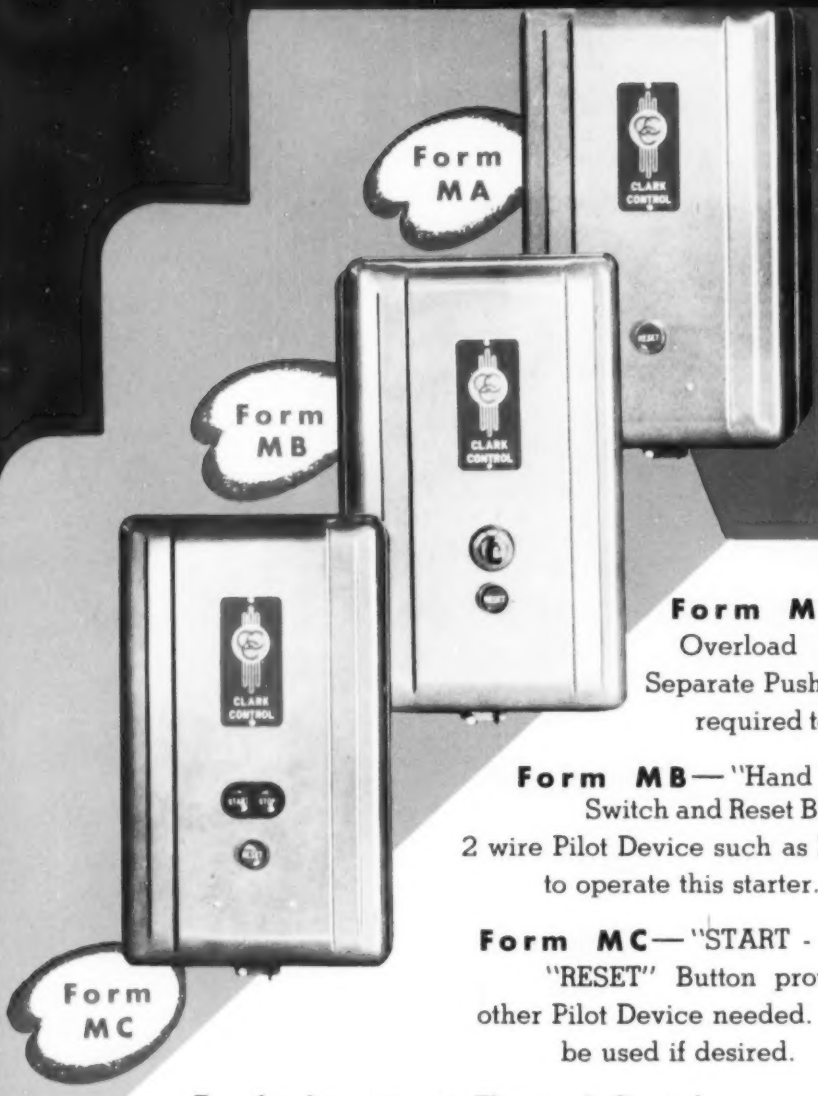

Form MA— Externally operated Overload Reset Button in cover. Separate Push Button or other Pilot Device required to operate this starter.

Form MB— "Hand - Off - Automatic" Selector Switch and Reset Button in cover. Separate 2 wire Pilot Device such as Float Switch must be used to operate this starter.

Form MC— "START - STOP" Push Button and "RESET" Button provided in cover. No other Pilot Device needed. Additional Push Buttons may be used if desired.

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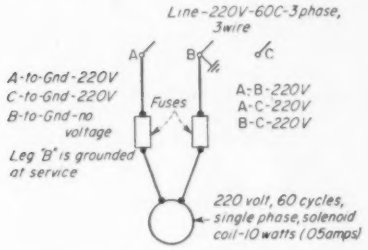
tors, but allow the starting coils to burn up or the holding coil in the starter will burn up.

Can your readers answer our problem?—D.W.

QUESTION D24—In the diagram below is it necessary to fuse both legs? If so, why? Can plug fuses, time delay type, such as Fusetron or Fustats be



used instead of cartridge type fuses? If not, why can't they be used? I do not think that a cartridge fuse can be purchased with a rating as low as .05 amps.—R.C.

QUESTION E24—It has been claimed by operating engineers that having the air gap different at the top and bottom of the rotor or armature will eliminate most of the wear on the bearings by causing the shaft to center in the bearings instead of resting on the bottom of bearings when rotating. What percentage of motors in use utilize this method? Just how much difference in air gaps should there be when the armature or rotor is not moving? Is it necessary to add or take off any turns from the field, armature or stator or add any device to cause the attraction of the rotor or armature to the upper part of the motor, or will just the proper adjustment of air gaps do this?—E.B.

QUESTION F24—I want to cut down the speed of a motor driven siren to obtain a desired "sound." The tone wanted is just about above starting speed. The siren is manufactured by W. S. Darley & Co., 7½ hp, current 4—220 volt 3 phase 60 C. 45 amps. 3500 RPM.

We have changed the blades without obtaining the desired sound.

What sort of controller would I need that can be safely used? Is there any other way of changing the sound waves, without cutting down the volume?

Reason for the above request—two houses of fire control are in close proximity and cannot distinguish the calls of their units.—A.S.S.

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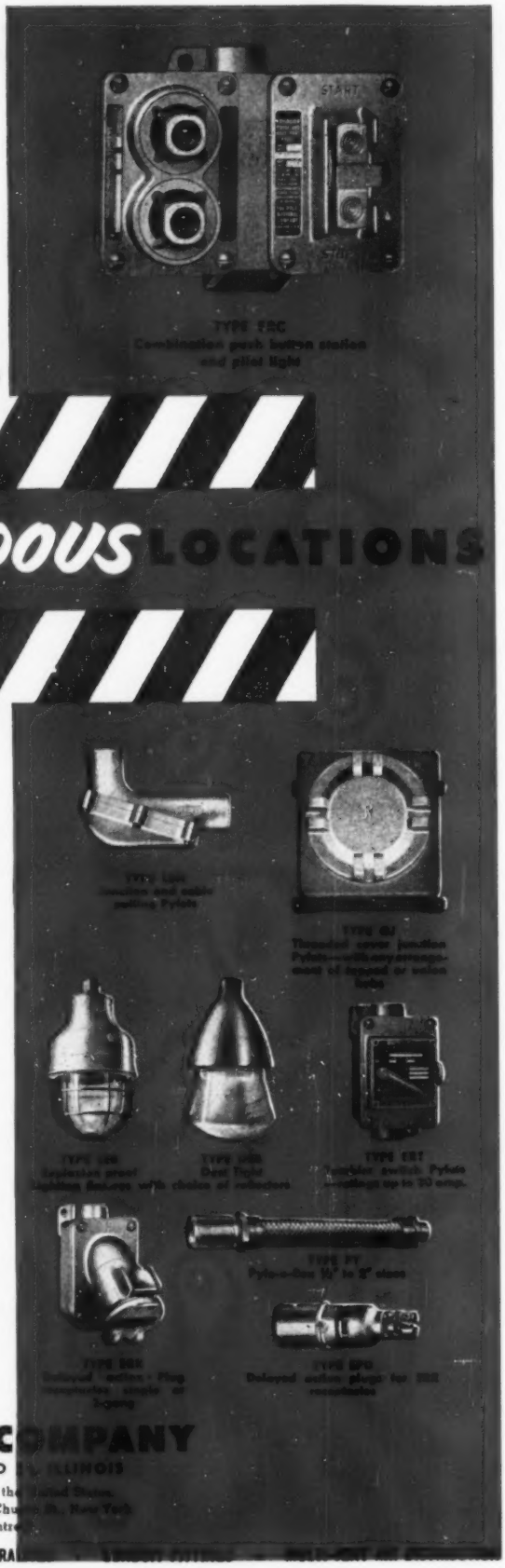

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Questions on the Code

Answered by

B. A. McDONALD, *New York Board of Fire Underwriters, Rochester, N. Y.*
GLENN ROWELL, *Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.*
B. Z. SEGALL, *Consulting Electrical Engineer, New Orleans, La.*

Bushing Insulator

Q. *We have just finished a new job on which we used a bushing insulator known as the "Insuliner" manufactured by the Thomas & Betts Company for the protection of conductors where they left bushings in pull boxes and cabinets. We have now been told that this type of bushing is suitable only for existing installations where it is necessary to provide protection for conductors leaving bushed ends of conduit where insulating bushings were not formerly employed and that we must use on all new work a bushing having an integral lining of a nonconductive nature. Is this required by the Code?*—B.F.S.

A. The insulating sleeve known as an "Insuliner" manufactured by the Thomas & Betts Company has been approved by the Underwriters' Laboratories and is designed to meet the requirements found under Section 3736 of the National Electrical Code. Therefore, unless the specifications governing the wiring installation which you have just finished specifically refer to some other type of insulation at the bushings, your installation cannot be considered a violation of Code requirements because of the use of this one manufacturer's product. While the Code at the present time requires the use of insulation at the bushings only when No. 4 or larger conductors are employed, more and more electrical specifications are now being prepared requiring insulation when smaller conductors are used.—G.R.

Grounding Portables Green or White Wire

Q. *We have occasion to connect many three phase motors of various horsepower using rubber cord and four wire twist-lock plugs and four wire Russel and Stoll plugs. It has been our practice to use the white wire of the rubber cord as equipment ground. Is this correct? One section of the Code states that green should be used while another section states that the white wire should not carry current. Also on a 220 volt single phase using a three wire twist lock plug, which wire should be equipment ground? On a 110 volt single phase motor we do use the green wire as the equipment ground and in this instance we feel we are correct.*—J.R.S.

A. According to Section 94002 of the Code, a flexible cord shall contain one conductor which is identified by any one of the six methods described. One of these methods covers the white or natural gray insulation. This conductor is intended to identify the grounded circuit conductor and is not supposed to be used as a grounding conductor for equipment.

Section 94003 requires the grounding conductor for equipment to show a green color. Notice the distinction between these two requirements. The white wire of a flexible cord indicates the grounded circuit conductor and the green wire indicates the equipment grounding conductor.

Section 2559-b of the Code permits the equipment grounding conductor to be run in flexible cords provided it is a bare conductor or, if insulated, it is finished to show a green color.

Section 2006-c of the Code permits a flexible cord having one conductor identified as required by Section 94002 to be used, even though there is no grounded conductor in the circuit supplying the outlet to which it is connected. Assuming that the three phase circuit is not grounded, this provision would permit the white conductor to be connected to one of the phase wires. If one of the phases was grounded however, the white wire must be connected to the grounded phase wire.

As a result of these provisions, a cord supplying a three phase portable motor whose frame must be grounded must have one conductor identified as required by Section 94002, which includes the use of a white conductor, and one conductor for equipment grounding which is bare or green. This green or bare conductor must be used for grounding the equipment. The use of the white wire for grounding the equipment would not satisfy the Code. Section 2521 of the Code provides for objectionable currents on grounding conductors and states that temporary currents, due to accidental conditions while the grounding conductors are performing their intended protective functions, are not to be considered as objectionable. I don't believe there is any conflict with this requirement on the application in question.

On a 2 wire, 220 volt, single phase circuit, the same rules apply. In this case, we have a three wire cord; one conductor identified as required by Section 94002 which includes the use of a white conductor and one conductor that is either bare or green. Here again the green conductor must be used for grounding the equipment.

On a 110 volt, single phase circuit, the white wire must be connected to the grounded circuit conductor and the green conductor to the equipment to be grounded.—B.A.McD.

Two Pole Circuit Breakers

Q. *On a number of filling station installations, I am now finding that the contractors are using conventional two pole circuit breakers on the circuits extending to the pump islands and inasmuch as the handles of the two pole breakers are tied together with a cross link or bar, they feel they are complying with the Code. Inasmuch as these are not simultaneous action breakers, am I not correct in refusing to accept such installations in my town?*—E.C.

A. Yes, the conventional two pole circuit breaker used in a circuit extending to a pump island at a gasoline filling station must be of the type which complies with the requirements of Section 3801, which specifies that a circuit breaker must be of the simultaneous action type as it is essential in the event of a fault current that both the ungrounded and grounded conductors be opened at one and the same time. Many two pole circuit breakers have the handles interlocked

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P&S 5301

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Totally Enclosed Plastic, with Plaster Ears, Non-T-Rated. Brown S.P. 1871, 3-W 1873. Ivory 1971, 1973.

P&S 1871

Best

Totally Enclosed Plastic, with Plaster Ears, T-Rated. Meets Fed. Spec. W-S-896. Brown S.P. 7301, 3-W 7303. Ivory 7301-I, 7303-I.

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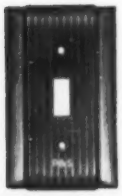
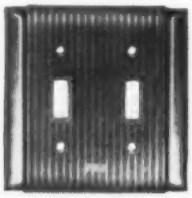
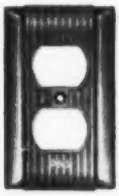
91072	92072	2-G Switch Plate
91101	92101	1-G Duplex Outlet Plate



P&S 91071



P&S 91072



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to facilitate manual operation of the breaker as a switch and still the design is such that in the event of a fault current or an overload one side may automatically open without necessarily opening the other side and inasmuch as paragraph d. of item 5142 of the Code specifies that all circuits supplying dispensing pumps shall be controlled by a switch having a disconnecting pole in each conductor, you are correct in your assumption that the use of a two pole breaker having the handles tied together does not necessarily comply with both references to the Code.—G.R.

Square Duct (Wireway)

Q. *Is it permissible to use square duct as a wireway in residential wiring?*

I have a new idea for wiring a house, whereby I plan to run square duct the length of the cellar and terminate it at the meter. Through this I would run the feeder to a circuit breaker panel and the branch circuits from the panel and through the duct to convenient locations along the duct where they would be spliced to short runs of BX cable to feed the outlets.

This would eliminate a multitude of junction boxes and the boring of beams. Each outlet would terminate in the duct and eliminate many conductors and splices at outlet boxes.

The Code neither allows or forbids this procedure.—S.P.

A. Square Duct is more or less a trade name, but is representative of about 30 some odd types of approved wireways.

The installation of wireways is of course covered by the Code general requirements of Sections 3001 to 3020, inclusive, and specifically by Article 362.

As stated in Section 3622 the installation of wireways is definitely limited to

a) industrial occupancies, with some exceptions,

b) garages,

c) theatres and

d) motion picture houses.

From this it may be deduced that the construction contemplated in your question would not be in accordance with Code requirements.

Where such an approved wireway is used as an auxiliary gutter in accordance with Article 374 for a service center in a residence it may be installed, but it would limit its use more or less to portions of the system near the service and meter center and distribution center.—B.A.McD.

Demand For Ranges

Q. *If I use a domestic oven rated at 4800 watts 115-230 volts on a 4 wire 120/208 volt service in a factory, does Table 29, column "C" apply? Can I use 3 No. 12 wires"?*—P.P.G.

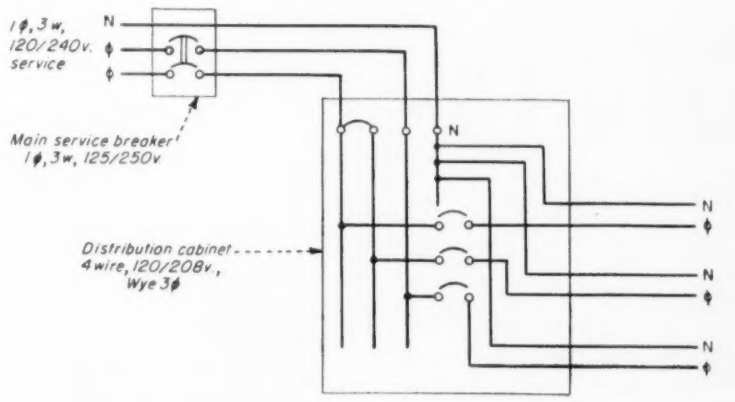
A. Table 29 covers the demand for household electric ranges and is the result of considerable study of the loading when used in dwelling occupancies. It is my opinion that this Table does not apply to either a domestic or a commercial type of range when they are used in a factory occupancy. Note 3 following Table 29, which reads as follows verifies this opinion to a considerable degree:

"Note 3. Generally, the demand for commercial ranges should be based on the maximum nameplate rating".

It appears to me that the conditions of loading in a factory would be more severe than in a dwelling and the runs which involve voltage drop are likewise longer. Since the heating effect of a range is greatly influenced by the voltage of the circuit, it is very important that it be operated at its rated voltage. Irrespective of my opinion of this rule, you may rest assured that any application of demand which results in voltage drop will also result in an unsatisfactory and inefficient operation. Your proposal to use a 230 volt oven on a 208 volt circuit could produce such a result. Three No. 12 conductors would not, in my opinion, be large enough. No. 10 should be used.—B.A.McD.

Three Phase Panel on a Single Phase Service

Q. *Is there anything wrong with the connections shown in the following diagram?*—E.Mc.K.



A. Assuming each branch circuit is properly protected and the main feeder is properly sized and protected by the main service circuit breaker there is nothing wrong with this installation.

Any trouble with the individual branch circuits will be taken care of by the branch circuit overcurrent devices in the panelboard. The main feeders cannot overload since the service breaker is selected to properly protect them.

This construction is commonly used in buildings where a small initial load is to be taken care of in the early use of the building. However, it is definitely known that there will be a large load growth at some later date and it is required that the panelboards and branch circuits be initially installed for this future load.—B.Z.S.

Lighting Standards for Filling Stations

Q. *One of our filling stations is installing a number of new lighting standards and some of these standards will be within 20 feet of the pump island. The factory supplying them has suggested that we stub conduit into the bottom of these lighting standards and then run the wires up through the central portion of the standard. Will this conform with the Code requirements?*—M. S.

A. Lighting standards which are not on the pump island but are located within 20 feet of the pump island shall have rigid conduit extending up at least 18 inches above the driveway with a sealing fitting located at that 18 inch level, as the 1953 edition of the National Electrical Code under paragraph b. 2. of Section 5120 states that in any outside location within 20 feet horizontally from any dispensing pump or island or from

any tank pipe fill or tank pipe vent shall be considered as a Class 1 Division 2 location which shall extend upward to a level 18 inches above the driveway or ground level. Electrical wiring and equipment below the surface of such areas shall be considered to be within a Class 1 Division 1 location. Therefore, in your case, if the lighting standard is within 20 feet of the pump island or the fill pipe or the vent pipe, the area up to an 18 inch level above the ground must be considered as a hazardous area and the provisions contained under Section 5015 of the present code will, of course, require the installation of a sealing fitting in each conduit run passing from a hazardous to a nonhazardous area.

Furthermore, the quite common practice of using the lighting standard column as a raceway for enclosing ordinary types of building wire is not in conformance with the requirements of the Code unless that standard is approved as a raceway. This often makes it necessary to place some form of raceway system within the average lighting standard used at filling stations and for other outdoor lighting. —G.R.

Service Tap

Q. *Is the tap shown by the diagram permitted by the N. E. Code?*—P. P. G.

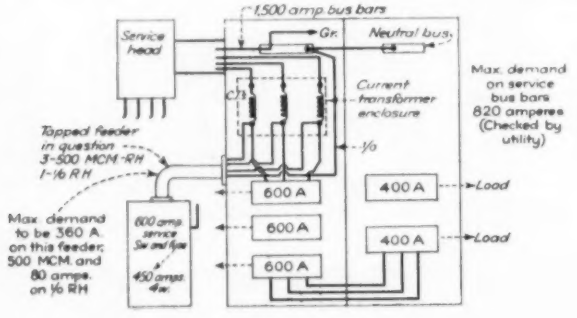
A. As I interpret the diagram, you have 1500 amp service entrance conductors, three phase four wire, which supply 3 - 600 amp and 2 - 400 amp service switches with 3 phase power located in one panel. I assume that these switches are approved for service use as required by Section 2351-a of the Code. In addition, a 600 amp switch is mounted outside of the main panel and is served by 3-500 MCM, type RH conductors and one 1/0 neutral conductor which is tapped to the 1500 amp main. This switch evidentally serves a three phase, 4 wire lighting and appliance load.

Since the tap in question is a part of the service conductors the 25-foot and the 5-foot tap rules covered by Section 2434-c-d do not apply. The question therefore concerns Article 230 on services. Reference to Section 2305-b shows that taps may be made to main service conductors for the purpose of feeding individual sets of service equipment as covered by Section 2351-a. The use of the tap, as shown on the diagram, is therefore recognized by the Code. The size of the tap however, is questionable and the length should be at a minimum. The size of the tap must satisfy the requirements of Section 2304-a which requires that the load be calculated as outlined in Section 2203. If the load in question is general lighting in an industrial occupancy, the total connected load must be considered in figuring the size of the tap. If this assumption is correct, the demand of 360 amperes, unless it was 100%, could not be used. There is also a question regards the use of a 450 amp fuse in the 600 amp switch served by 500 MCM - RH conductors which have a carrying capacity of 380 amperes.—B.A.McD.

Type UF Conductor

Q. *A salesman from a wholesale house told us that he understood there would soon be a new wiring material available designed for direct burial in the earth and inasmuch as the Code refers only to Type USE wire, we wonder if this is a new type or just another USE conductor.—P.H.*

A. The 1953 edition of the Code will contain a new article covering a new type of conductor to be known as Type UF. This is an underground feeder and branch circuit type of cable designed for direct burial in the earth just as Type USE cable is installed. However, it is designed for feeder conductors or branch circuit conductors between buildings and not as service to a building as the new code will require this Type UF conductor be protected by overcurrent protective devices of the proper rating at its source of supply. This conductor has been developed largely to supply the demand on farm wiring for feeders between a point of distribution and various buildings on the farmstead as a replacement for the overhead wiring so commonly used today on our farms. This new Type UF cable may also be used for interior wiring when complying with the provisions of Article 336 and may also be used in wet locations. —G.R.



Note: Utility Co will permit a tap on the load side of the current transformers

Conductors In Conduit

Q. *Is it permissible to use 3 No. 10 TW and 1 No. 18 TW in ½ inch conduit? Actually the 1 No. 18 will not be used but the 40% area of conduit rule, I believe, applies. A substantial saving can be realized using ½ inch conduit instead of ¾ inch conduit for 3 No. 10 TW.—A.H.S.*

A. According to Section 3466, one conduit shall not contain more conductors of a given size than are specified in Tables 4 to 11 of Chapter 10. Table No. 4 is based upon Type R dimensions and applies to combinations of 1 to 9 wires all of the same gauge. This Table requires the use of ¾ inch conduit for 3—No. 10 conductors. According to Table 13, the area of a No. 10, type R conductor is .0460 and the area of a ¾ inch conduit is .53 sq. inches. It therefore follows that 3 No. 10 in ¾ inch conduit uses only a 26% conduit fill. If these conductors were installed in a ½ inch conduit, we would have a 46% conduit fill. While a 26% conduit fill is small and the 46% fill is large for this combination of conductors, it would be impossible to level off these percentages without resort to the use of an intermediate size conduit such as ⅝ inch. This appears to be impracticable and in the absence of such intermediate size conduits we will obtain cases where the percentage conduit fill is low.

When a group of conductors, not covered by Table No. 4, is involved, Table No. 11 applies, but in using the percentages of conduit fills, when new work is involved, the areas of Type R conductor insulation must be used. The smaller areas of the small diameter conductors are only recognized for rewiring in existing raceways as covered in Table No. 11. In the case you present, the sq. in. area of the No. 10 conductor would be .046 and the

area of the No. 18 conductor would be .0167. The total area of the combination would be .138 + .0167 = .1547. The sq. in. area of a ½ inch conduit is .30 and 40% of this area is .12 sq. in. Such a combination would result in about a 50% conduit fill which exceeds 10% of the 40% limit covered in Table No. 11. If the Code permitted the use of the actual TW conductor areas the conduit fill would be about 26%. At the present time, the Code is not too clear on this point. As a result, it is quite possible that the new 1953 Code will clarify the matter with the following provision under Section 3466:—New Work: Where conductors of various sizes to be used in combination, use Tables 11 and 12 of Chapter 10 and the dimensions of rubber-covered conductors from Table 13.

It also appears to me that if the use of the No. 18 wire was for the sole purpose of evading the use of Table No. 4, the Inspection Authority would criticize such procedure.—B.A.McD.

Fluorescent Fixtures

Q. *In a proposed building, they plan to use the perforated metal acoustical pans below a cement slab ceiling with fluorescent fixtures hung flush in this acoustical ceiling. Will the Code permit the placing of outlet boxes in this cement slab ceiling and the equipping of these outlet boxes with cover plates containing convenience outlets and the connection of more than two fixtures to each box by means of a flexible cord?*—B.R.

A. If noncombustible acoustical material, such as spun glass or rock wool, is used on top of these metal pans, Section 4125 will give permission to use Type S or SJ cord for the connection of a fixture directly below the outlet on which the convenience outlet cover is placed. This would make it impossible to supply more than two fixtures from any one outlet box location.—G.R.

Color Code Multi-Wire Circuits

Q. *Under Section 2112 of the National Electrical Code, it is required that all conductors of multi-wire branch circuits be color coded. Due to the great difficulty in obtaining copper wires, factories usually supply only two colors, black and white.*

For the duration of this emergency some local authorities have waived

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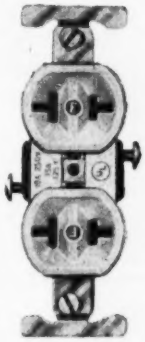

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Duplex flush receptacle with wide ears T slots meets Federal Spec. W-R-151A.
10 Amperes – 250 Volts
15 Amperes – 125 Volts
Ivory –

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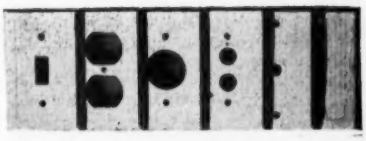

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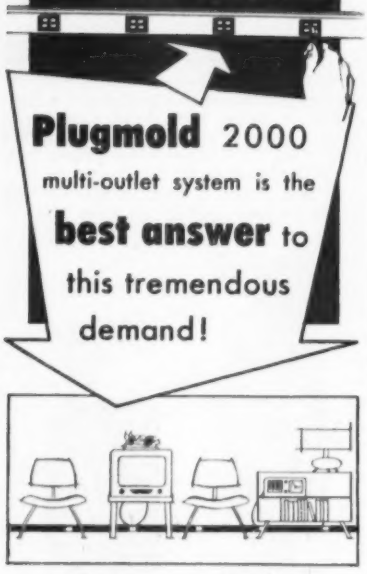

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this section, by accepting black wires for the line wires, and white for the neutral wires. Other authorities have accepted the color coding of the wires by painting the ends of the wires at the outlet and/or junction boxes. We will appreciate your comments on the following:—

(a) Is the painting of wire-ends sufficient to comply with Section 2112 of the National Electrical Code?

(b) Has there been approved, during this emergency, any waiver to Section 2112 of the code?—C.A.C.

A. It is my opinion that the color coding required by Section 2112 of the Code intends that the conductors shall be continuously identified and that painting of wire ends at terminal points would not be sufficient to satisfy this Code provision. I do not know of any official interim amendment during the present emergency that tempered this requirement in any respect. The fact remains, however, that during periods of emergency when the use of critical materials are restricted and shortages result, we must use in the most efficient manner the materials which are available. Under such conditions any endeavour to enforce the color code provision would be futile. I believe, as pointed out in your question, that most inspection authorities have recognized this fact and as a result have waived full compliance with this Code provision during periods of emergency and shortages. This comment does not intend to discount the importance of code coloring, since I personally believe it should be enforced whenever it is practical to do so. It appears to me that this question has been decided by local authorities and not by Code action. If the provision is waived, I believe color coding of conductors at terminal points would achieve to a considerable degree the objectives desired.—B.A.McD.

Lightning Arrester Connection

Q. *Which is the proper way of connecting a lightning arrester in a combination pole mounted transformer, to the line side of the primary switch or the load side?—J.D.*

A. Section 2803 of the Code requires the arrester to be connected on the line side of all connected station apparatus. Section 2825 however recognizes the fact that an isolating or disconnect switch may be installed ahead of the arrester when the voltage test specified is satisfied.

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Section 2391 of the Code requires lightning arrester protection on service conductors exceeding 600 volts when called for by the authority enforcing the Code. In this case, the arrested installation shall comply with Article 280 and be located on the supply side of the service equipment. Section 2632 covers the interconnection of the primary and secondary grounds.

According to the above subject rules a lightning arrester protecting the primary supply to a transformer must be located ahead of the transformer, preferably as near as practicable to same. It also must be connected ahead of the primary switch or breaker which is recognized as the main service disconnect. An isolating switch may be installed ahead of the arrester if Section 2825 is satisfied.—B.A.McD.

Official N.E.C. Interpretations

INTERPRETATION NO. 392

(Issued June 11, 1953)

ARTICLE 250—Isolated Systems (Ungrounded)

Statement: In a hazardous location it is proposed that a 120 volt, alternating current system be isolated instead of grounded. The isolation will be achieved by the use of two transformers and an intermediate circuit. The first transformer steps the voltage down from 2400 volts to 120 volts. It is pole mounted. The second transformer is an isolating transformer on the premises. It is proposed that the intermediate circuit be grounded, the interior circuit be insulated from ground, and that both transformers be provided with lightning arresters. The intermediate circuit is wired with cable having a grounded sheath. The interior circuit is in conduit and all equipment in the building is suitably enclosed for the class of hazard involved. The interior circuit has a ground indicator and there is competent supervision over it at all times.

Question: This system does not comply with Section 2514 in that the interior circuit is not grounded, but is it judged to provide a suitable alternative to grounding as given in Section 2501?

Answer: Yes, provided the degree of the supervision of the installation by the user is judged satisfactory by the authorities having jurisdiction.

INTERPRETATION NO. 393

(Issued June 11, 1953)

SECTION 2351—Service Disconnect Means

Question: Do two fused pull-out switches, connected in multiple, mounted in a single cabinet, complying with the constructional requirements for service equipment, and providing two disconnecting means for the service, meet the provisions of Sections 2351 and 2371 of the 1951 Code without an additional single main disconnecting means?

Answer: Yes.

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The modernization of the State Savings Bank in Hartford, Conn., effectively proves that it is possible to change the entire appearance of a building without altering major architectural features or destroying the charm of period chandeliers and high vaulted arches. As indicated in the accompanying photograph, the bank was formerly flanked by grilled tellers' cages, decorated by dark-colored murals which were barely discernible in the inadequate general light, and dated by multi-color marble flooring and wainscoting. The four main lighting fixtures, containing bare low-wattage incandescent lamps, had been revamped through the addition of several Swivelier bullet-type spot units, but the end result was not greatly altered either in appearance or general benefit to employees.

The reconditioning program did not touch the high arched windows or the pleasingly proportioned domed section above the bank's public area, yet all other features were redesigned to give the building a look of progressive modernity.

For example, the old chandeliers were replaced by four Charles Parker units, each equipped with 20 60-watt filament lamps shielded by translucent shades. These units, spaced on 15-foot centers to form a square, closely follow the design of the original fixtures and retain the New England atmosphere which formerly existed.

In addition to light received from these four units, general illumination is provided by 11 Rambusch recessed spots set in the 24-foot ceiling on 6-foot centers and a 12th similar unit placed in the center of the dome.

Spots around the perifery are equipped with 500-watt flood lamps; the one in the center with a 750-watt flood. The combined light from these two main sources provide an average of 50-fc for cashiers' counters.

In the rear of the banking area, where the ceiling drops to a 12½-foot height, 30 3-lamp Holophane units were recessed into the acoustical tile ceiling, 9-feet on centers lengthwise, 6-feet on centers longitudinally. Lamps in these units are 40-watt T12s, two lamps in each unit being standard cool white, the other one warm white. Along the front lip of this dropped ceiling section are four square Holophane recessed units containing 100-watt daylight filament lamps. Average illumination on desks is 40-fc.

Incidental lighting includes a bottom-edge-lighted "New Accounts" sign and T-8 fluorescent lamps above card files behind the cashiers' booths.

ADDITION OF NEW FIXTURES, recessed downlights, lensed fluorescent luminaires and edge-lighted signs, plus removal of murals and teller grill-work, effectively modernizes this banking interior, improves accuracy and speed of cashiers, and creates new confidence in progressive methods.

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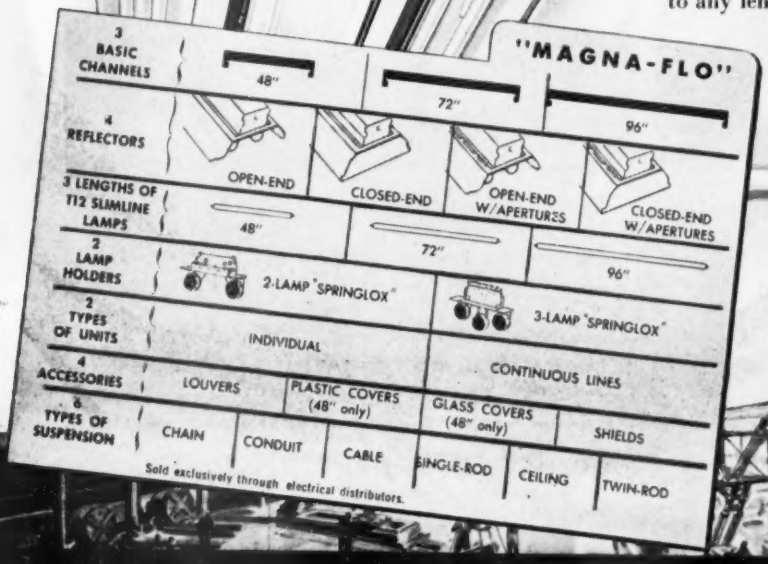

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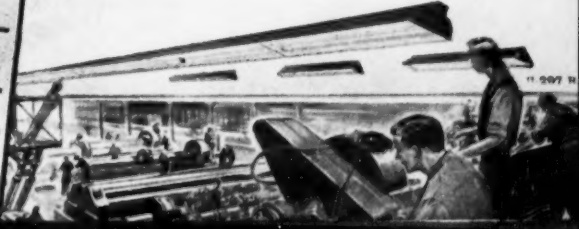

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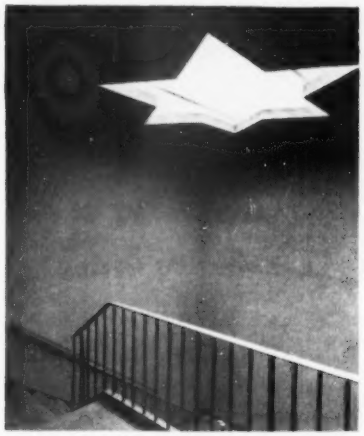
DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

Lighting Plan for a House of Worship

The Kingsway Jewish Center in Brooklyn, N. Y., employs a combination of cove treatments, recessed units and back-lighting installations to provide 20 footcandles of general illumination to pews in their large synagogue, and 25-fc to the Ark.

The general plan consists of coves running the length of each of three long bay areas, with each cove containing two continuous rows of 8-foot T-12 standard cool white lamps mounted end to end in Beaux Arts white-enamel reflectors. In addition, the synagogue is illuminated by 76 recessed Beaux Arts downlights equipped with R-40 flood lamps of the 150-watt size. Twenty of these recessed units are mounted above each of the two low-bay side areas, while the remaining 36 fixtures are installed over the central bay. The floor area is 110-by-74½-feet and the ceiling heights in the high and low bay sections are 34 and 22 feet respectively. Relamping of recessed units is performed from a cat walk above the ceiling while cove-lighting is maintained from ladders equipped with skidproof rubber feet and platforms for the support of maintenance accessories.



SIX-POINTED STAR above stair-well consists of cellular grid lighted by cool white fluorescent lamps 18-inches above it on 12-inch centers. This star, plus R-40 recessed floods in the corners of the stair-well, delivers average of 16-fc to stair treads and landings.

The two stained glass windows flanking the Ark are back-lighted by 2-lamp 40-watt suspended reflectors holding standard cool white lamps. These reflectors are located in small storage closets. This same type of unit is also used above each side window. The color combination includes grey wood wainscoting and pews, red flooring, red velvet seats, white upper walls and ceilings.

The stairway, part of a former building had previously been illuminated by a skylight during the day and an incandescent fixture after dark. This installation has been modernized so that the center ceiling over the stair-well now contains an illuminated six-pointed star, 9 feet across, with ten 8-foot T-12 standard cool white fluorescent lamps on 1-foot centers mounted 18 inches above the 3-by-3-by-3-inch white enamel cellular grillwork of the star's surface. The four corners of the stair-well are lighted by 150-watt R-40 flood lamps in recessed circular-louvered assemblies. This installation provides between 15 and 17 footcandles on stair treads and landings. The color scheme includes tan terrazzo steps, dark green walls and balustrades, aluminum hand rails and grey walls.

COVES AND RECESSED DOWNLIGHTS combine to provide 20-footcandles of illumination to pews, while backlighting of stained glass windows on either side of the Ark serves to make that location a focal point of interest.

Narrow Case Coves Highlight Displays

Using lighting as an effective sales tool, Gimbels Department Store in New York City maintains a comfortable level of general illumination in their dress and millinery departments, then utilizes specially-designed case reflectors and several varieties of coves to highlight displays and promote architectural interest.

The cases, designed by stylist Raymond Loewy, are lighted with T-12 white fluorescent lamps housed in narrow front-edge reflectors. Over 100-fc of illumination is delivered to case merchandising displays from these fluorescent fixtures.

100 FOOTCANDLES at front of display cases, 58-fc on dress racks along wall and general intensity of 20-fc throughout this sales area effectively highlight merchandise while maintaining comfortable level of illumination in aisles.

General illumination is furnished by direct-indirect luminous bowl fixtures lamped with 200-watt filament bulbs that provide approximately 20 footcandles throughout the merchandising area and aisles.

Coves above and in front of dress racks highlight racked dresses to a level of 58-fc. Overall color pattern includes white ceiling, soft pink walls and columns, green floor covering. Millinery cases are lined with green metallic cloth.

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HOLOFLUX RECESSED fixtures on 8-foot centers, wired and switched for 2-level lighting, provide intensities up to 42-fc in this architect's office.

2-Level Light Control for Architect's Office

An average illumination of 25 foot-candles for conferences or a higher level of 42-fc for paper work or the study of plans is available in the 17-by-15-foot office of architect J. A. Britton of Greenfield, Mass., through the installation of 3-lamp recessed lighting fixtures and multiple switching to control either one or two lamps in each fixture.

Fixtures are Holophane Holoflux units equipped with preheat T-12 lamps, mounted in the 11-foot-high ceiling at a distance of 8-feet center-to-center. Color variety is obtained by using standard cool white lamps in the 1-lamp circuit, and deluxe cool white for the 2-lamp switching arrangement.

The room is surmounted by a flat white acoustical tile ceiling, driftwood wall paneling, green carpeting and draperies combining red, white, tan and brown.

Levels of illumination were measured after the installation had been in service for approximately a year.

SINGLE-LAMP Alzak recessed troffers in seven rows provide 54 fc to tabulating department of Marsh and McLennan, N.Y.C., using 6-foot, standard warm white T-12 lamps. Brightness ratios are minimized by using light tan wainscoting and light tan and brown asphalt floor tiling.

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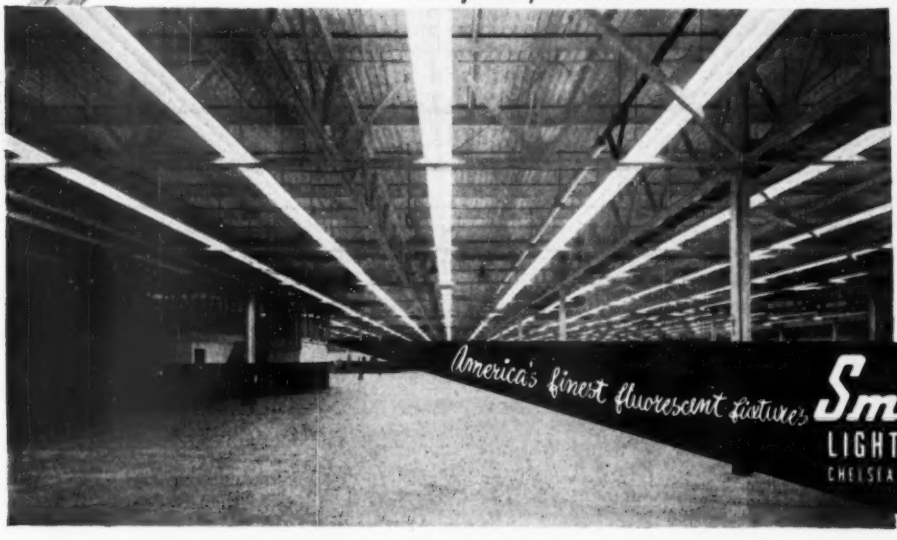

Continuous row installation in one of the nation's newest and most modern plants . . . over 5000 Smithcraft A.L.S. 8' Industrial Slimline units lighting 397,000 sq. ft. of floor space. Notice the continuous lines of light with no interrupting dark areas between fixtures and how uplighting lights the ceiling reducing contrast.

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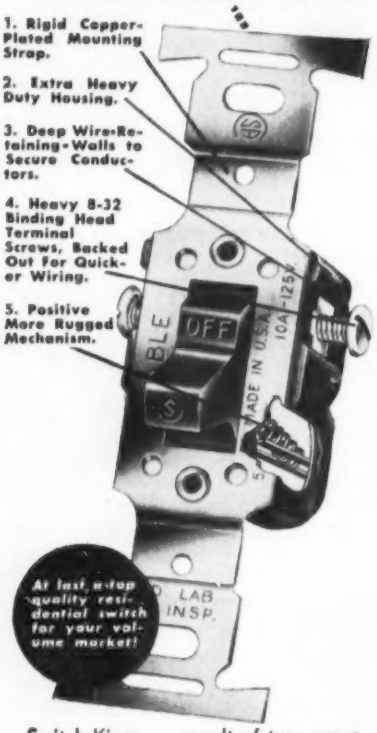
THESE SPECIAL FEATURES CUT INSTALLATION COST . . . ASSURE MAXIMUM SERVICE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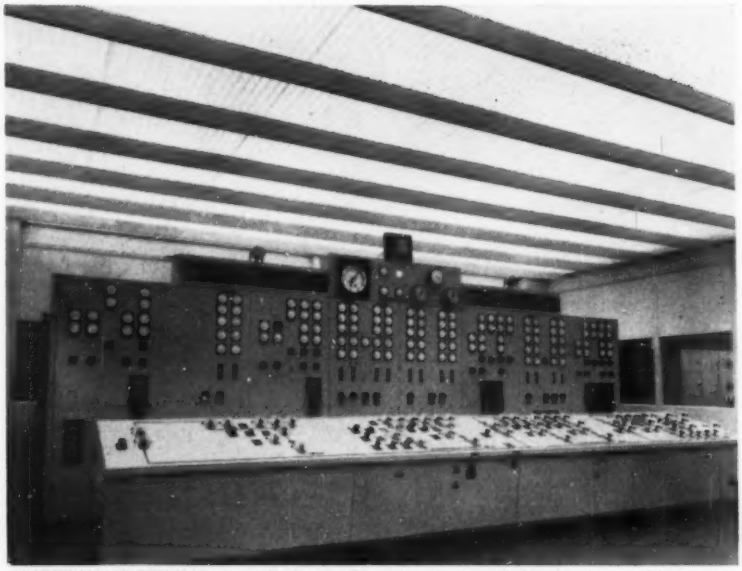


THREE-WAY-CEILING installed at Case Institute of Technology, Cleveland, was used for test purposes to determine efficiency of luminous-acoustical ceiling treatment for air, sound, and light conditioning.

Three-Function Luminous Ceiling

A luminous ceiling installation, purposely designed to serve three separate functions, was installed at Cleveland's Case Institute of Technology for research and test purposes. Combining air, sound and light conditioning features, it incorporated a standard Wakefield luminous-acoustical ceiling using Plexiglas corrugated diffusers and acoustical baffles, with air forced into the entire open plenum above the luminous ceiling.

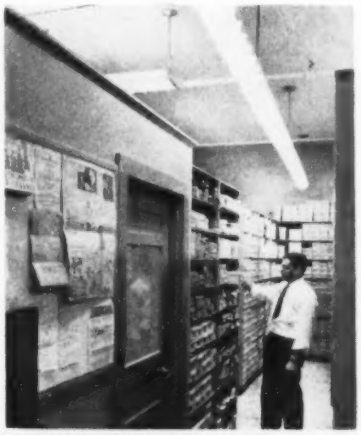
Tests conducted in this experimental room proved the luminous ceiling to be an excellent air diffuser as well as an efficient lighting system. Acoustical baffles spaced on 36-inch centers served to reduce the noise level effectively, as well as to support the corrugated plastic sheets. Incorporating features for these three separate functions, as it does, has resulted in its being aptly called a "three way ceiling".

The air conditioning feature was provided by resting the corrugated plastic sheets on the acoustical baffles with approximately one inch of open area through which the air is filtered at low pressure. This provides air diffusion without annoying currents of air to occupants of the room, according to the Case Institute studies. Also, it is pointed out that in most installations of this type the duct work and opaque metal diffusers can be eliminated, with savings up to 40 cents per sq. ft.

With this type of Wakefield ceiling high level illumination of from 55 to 110 fc can be provided with lamp spacings of 36 or 18 inches.

Single-Lamp Fixtures Light Narrow Stockroom

An effective lighting job was obtained in the narrow stock room of H. E. Hamilton Company's shoe store in Greenfield, Mass., by installing Leader white-enameled clip-on louvered corridor units end-to-end. Units are equipped with 30-inch mounting stems and 8-foot T-12 deluxe cool white lamps. High reflectance is obtained by specifying white acoustical tile ceiling material, light blue walls and a light buff asphalt floor tiling. Vertical footcandle measurements after a year's service are 35 on the top shelves, 20 half way down and 10 on the bottom shelves.



LOUVERED CORRIDOR UNITS mounted on stems beneath white ceiling tiles provide 35-, 20- and 10-fc of illumination on vertical plane at top, center and bottom shelves of this shoe stock room.

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UNIT BREAKER
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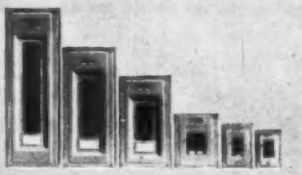
Basically 3 Components

The C-H Unit Breaker consists of case, individual circuit breakers, and cover. Easy to assemble, and install.



6 Cases—32 Circuits

Only 6 case sizes handle all needs to 32 circuits. Also raintight and special types available.

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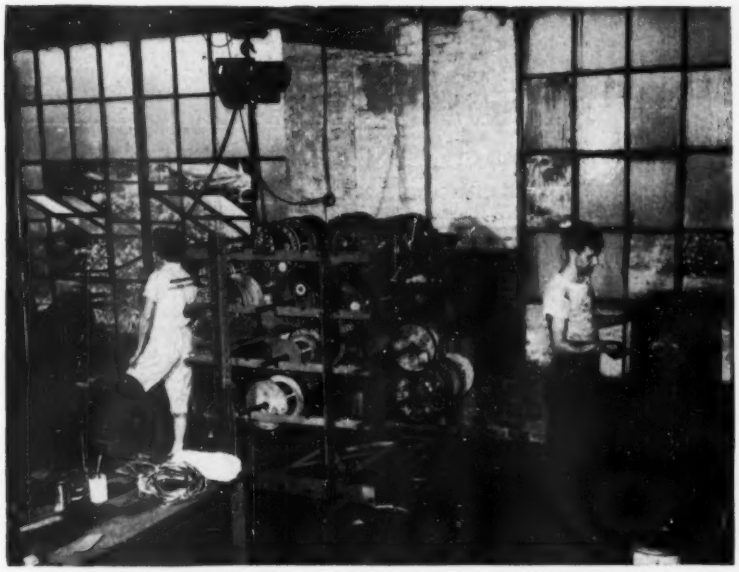
Ambient compensated. No pre-tripping in hot climates. Thermal magnetic protection against heavy overloads and shorts. Compact, rugged, lasting, dependable. Quick make and break for long contact life. Famous C-H Quality.

Motor Shops



DOUBLE-ENDED REEL RACK permits two coil winders to work simultaneously without hazard of wire entanglement. Rack arms can be raised or lowered to fit reel diameter requirements. Electric hoist is used to add or remove wire spools.

Adjustable Reel Rack Serves Two Winding Heads

Two coil winders can operate simultaneously using magnet wire from a single reel rack at the Barberton, Ohio, branch shop of the Berthold Electric and Engineering Company. Winders work back-to-back with a double-ended, four tier, adjustable rack between them.

Basic frame for the rack consists of four angle-iron (3½ in. by 2½ in) posts, each about 67 inches high and mounted to a sturdy channel iron base measuring about 28 inches by 60 inches (span for reels). To each set of posts are bolted four parallel, 48-inch long angle-iron arms which support the cross rods on which the reels are placed. Each arm extends about 10 inches beyond the upright. A series of mounting holes in each upright permits adjustment of arm height (in 2-inch steps) to accommodate wire reels of varying diameters. Supporting arms are notched on 8-inch centers to seat the reel rods.

With this arrangement, magnet wire can be fed from both sides of the rack at the same time to the respective winding heads. Wire tension devices can be applied at the winding machine, or mounted on a wood cross piece placed between the rack arms at winding head height.

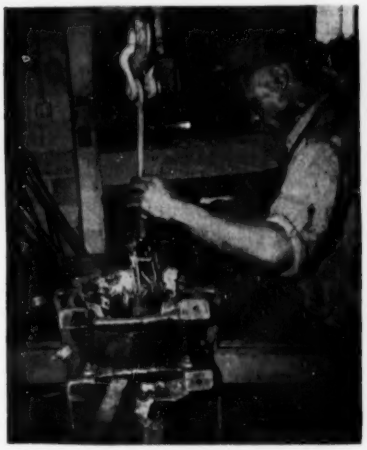
A monorail electric hoist travels directly over the rack; is used to raise and lower the reel bars for removal or addition of wire reels or spools. Greater winding speed, less confusion, and no magnet wire entanglements are advantages Berthold personnel enjoy with this device.

Crane Hoist Pulls Stator Coils

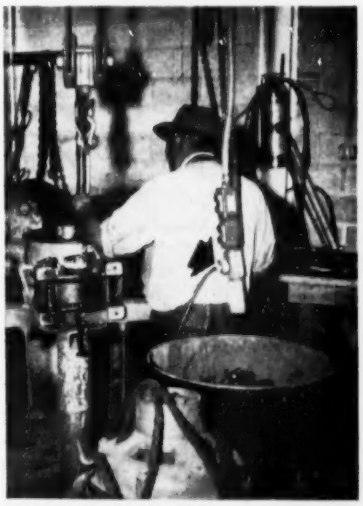
Normally, an overhead crane in a contractor's shop or motor repair department is used only when there is heavy equipment to be moved about. The rest of the time it stands idle representing a costly, but necessary investment.

Forethought in shop arrangement and development of a couple of "shop kinks" at the T. L. Rosenberg Company, Oakland, California, electrical construction and repair firm, permits greater return on the crane investment through additional use. The stripping department of the motor repair division is located at one end of the crane runway serving the equipment storage area. By adding a detachable coil-gripping claw and a plug-in type foot-switch, shop mechanics transformed the overhead crane into a handy piece of coil-removal equipment. Another feature: valuable floor space and investment normally required by a coil-removal unit is saved.

The detachable claw has a clevis on one end which can be quickly slipped on or off the hoist hook. Up and down operation of the hoist (and claw) is maintained by a simple, easy-to-operate foot switch connected by heavy-duty flexible cable, plug and receptacle added to the suspended pushbutton control for the crane. The mechanic



COILS ARE REMOVED with a claw-grip attached to overhead crane hoist hook by slip-on clevis. Underside of coils were cut before stator was clamped to pedestal.

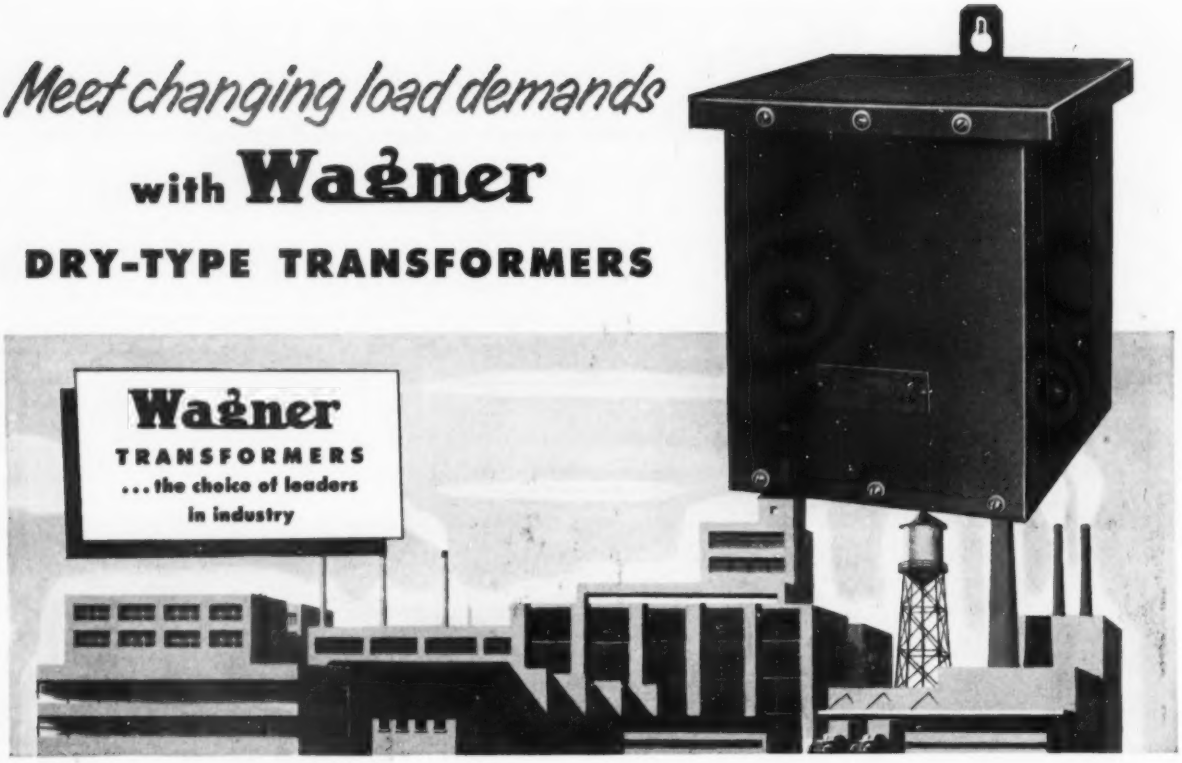


DETACHABLE CONTROL cable plugs into receptacle (arrow) added to conventional crane pushbutton control station. When cable is removed, crane is ready for normal use.

Meet changing load demands

with Wagner

DRY-TYPE TRANSFORMERS

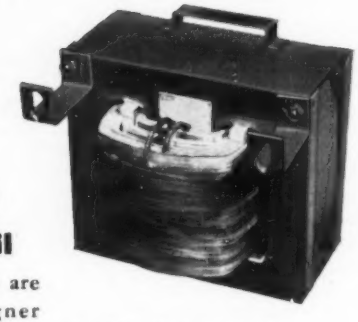


Wagner dry-type transformers can solve your problems by putting the right voltage close to the load wherever machines, portable tools or lights require voltage changes.

SAFE- Wagner dry-type transformers meet all requirements for indoor installation. They will save you money on insurance premiums. Fireproof vaults or other special protection are unnecessary—even where fire hazards are present.

ECONOMICAL- When you use Wagner dry-type transformers, you reduce installation costs—you reduce line losses—you eliminate long runs of secondary copper—and you can forget about maintenance.

COMPACT- Wagner dry-type transformers are small in size—light in weight—easy to install and easy to move whenever changes in plant facilities make it necessary.



Form W

Core and Coil

These transformers are built in the Wagner Form W design with cores of cold rolled oriented grain transformer steel which permits less weight per kva and small size cases for space-saving installation.

80° C Rise — Class B Insulation

Safe operation is assured through the use of class B inorganic insulation throughout the coil structure. Liberal ventilating ducts provide high short time overload capability. Available in sizes 3.0 to 100 kva, 600 volts and below.

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BRANCHES IN 32 PRINCIPAL CITIES

153-7

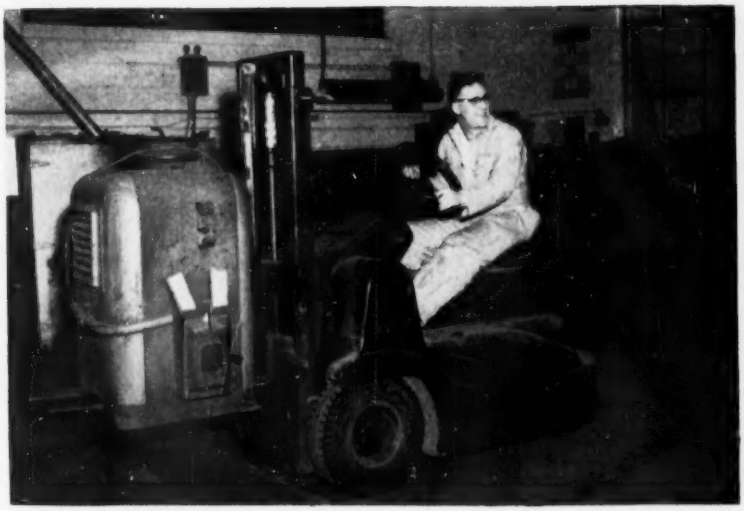
FOOT SWITCH assembly (arrow) has actuating rocker plate and fatigue-reducing heel rest. Tilting plate to one side raises hoist, pressure on the other side lowers hoist and coil-grip.

places the toe of his shoe on a rocker plate over the foot-switch. Tilting the plate to one side raises the hoist hook and claw. Shifting foot pressure and tilting the plate to the other side lowers the hook. A heel rest added to the switch assembly provides foot balance and relieves muscular tension.

After all coils are removed the stator is unclamped from the stripping pedestal, the claw is removed from the hoist hook and the foot switch unplugged. The crane is now ready for normal use in the storage bay.

Motorized Lathe Attachment Speeds Mica Undercutting

Undercutting mica on motors up to 30-hp capacity is performed accurately and quickly in the shop of Walter J. Rider, Binghamton, N. Y.

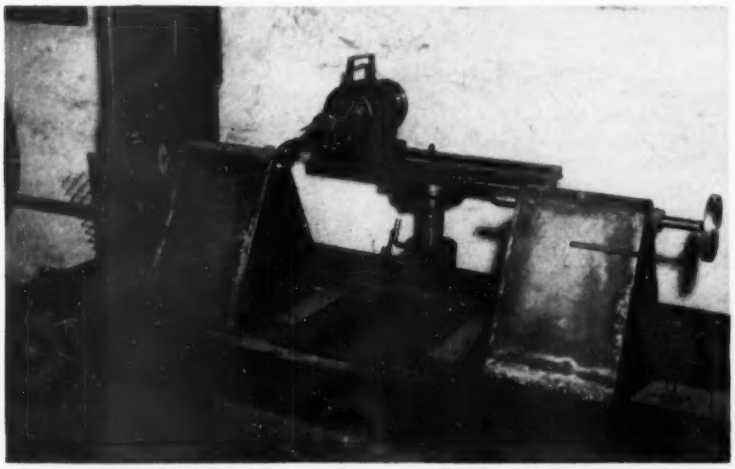


FORK LIFT TRUCK takes the drudgery out of moving heavy equipment around roomy motor repair shop at Clarence W. Silver Co., Salt Lake City, Utah. Gasoline-driven unit has a 2500-pound capacity; can lift loads seven feet. Here, shop supt. J. D. Morgan brings an ac welder into shop for overhaul.

The undercutting device is a standard power unit equipped with shaft and assorted milling wheels. However, to insure accuracy of depth and straightness of cut, the motorized device is mounted on a grooved bedplate which is held parallel to the axis of a bench lathe. Locknuts make it possible to regulate the height of this bedplate, and the length of the shaft on the undercutter motor is such that the commutator saws and milling cutters are always directly above the lathe centerline.

When a commutator is to be undercut, the armature is first positioned between the lathe points, the undercutter fitted with a cutting wheel of the desired diameter and thickness, and the height of the cutting edge is regulated by adjusting the height of the grooved bedplate. Then, by hand, the undercutting device is moved along the bedplate. The resultant cut of the mica is automatically straight, and of the proper depth and width.

Two identical 30-hp motors recently were received by the Rider shop for commutator undercutting and, to obtain an accurate estimate on the comparative times between hand and motor work, one of the commutators was undercut by the just-mentioned method while the other was undercut by hand. According to Rider, the hand job took a full 8-hour day while the motorized operation, after adjusting the cutting device, took less than half an hour.



IN THE GROOVE of an adjustable bedplate, this undercutting motor is moved along parallel to the axis of the bench lathe. After an armature is centered and the cutting wheel adjusted for depth, mica can be automatically undercut in 10% of the time required for a comparable hand job.

Portable Control for Extra-Long Test Leads

It's not always convenient to bring motors and other electrical equipment up to a shop panel for testing. Frequently it means moving other equipment out of the way to clear a space in front of the panel.

Management of the Clarence W. Silver Company in Salt Lake City, Utah, did not want this condition to develop in their new 40-ft. by 45-ft. shop area assigned to large equipment repair. The shop is designed so that all work benches and repair equipment are parallel to and along the four shop walls. The center area is open and reserved for equipment being repaired.

When the question of providing a 440-volt, three-phase test circuit came up, management studied two possibilities; (1) installation of multiple test

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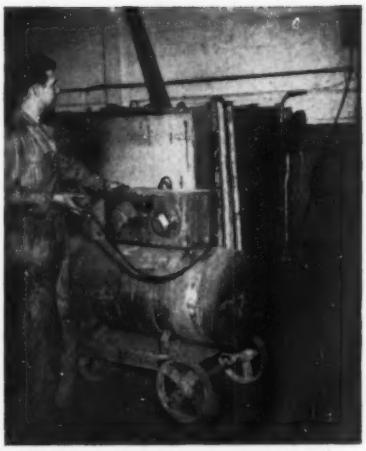

REMOTE CONTROL BUTTON plus long test leads on 440-volt, 3-phase magnetic controller permits testing of equipment anywhere in the repair shop. Control and test cables are coiled up on brackets when not in use.

outlets along the perimeter of the room; (2) installation of one outlet with extra long test leads and remote control, pushbutton facilities. The extra cost of the multiple-outlet scheme more than offset the dubious advantages to be gained. So the latter method was chosen.

The test circuit, as installed, consists of a conduit and cable run originating at a fused disconnect switch and terminating in a Size 2 magnetic controller on the building wall. Test leads consist of a 40-foot length of 3-conductor, No. 6, flexible cable in a heavy-duty rubber jacket and equipped with insulated spring clips. A 40-foot control cable (3-conductor, No. 14 in heavy-duty rubber jacket) terminates in a "start-stop" pushbutton station. Red indicating lamps above the controller light up when the "start" button is pushed; go out when the "stop" button is operated.

With these leads, a mechanic can extend a 440-volt circuit to a motor anywhere in the shop, start and stop the unit through the remote control cable, make the necessary running tests, then coil up the leads and control cable on hook brackets mounted to the wall under the magnetic controller.

Rack and Hoist Arrangement Facilitates Reel Storage

Wire reels are conveniently, compactly and securely stored by the Warwood Armature Repair Company, Wheeling, W. Va., on a series of racks constructed from angle irons secured by welding. Large reels are stored at or below eye level, on the three lower tiers of the five-tier rack, while smaller spools are kept on the upper

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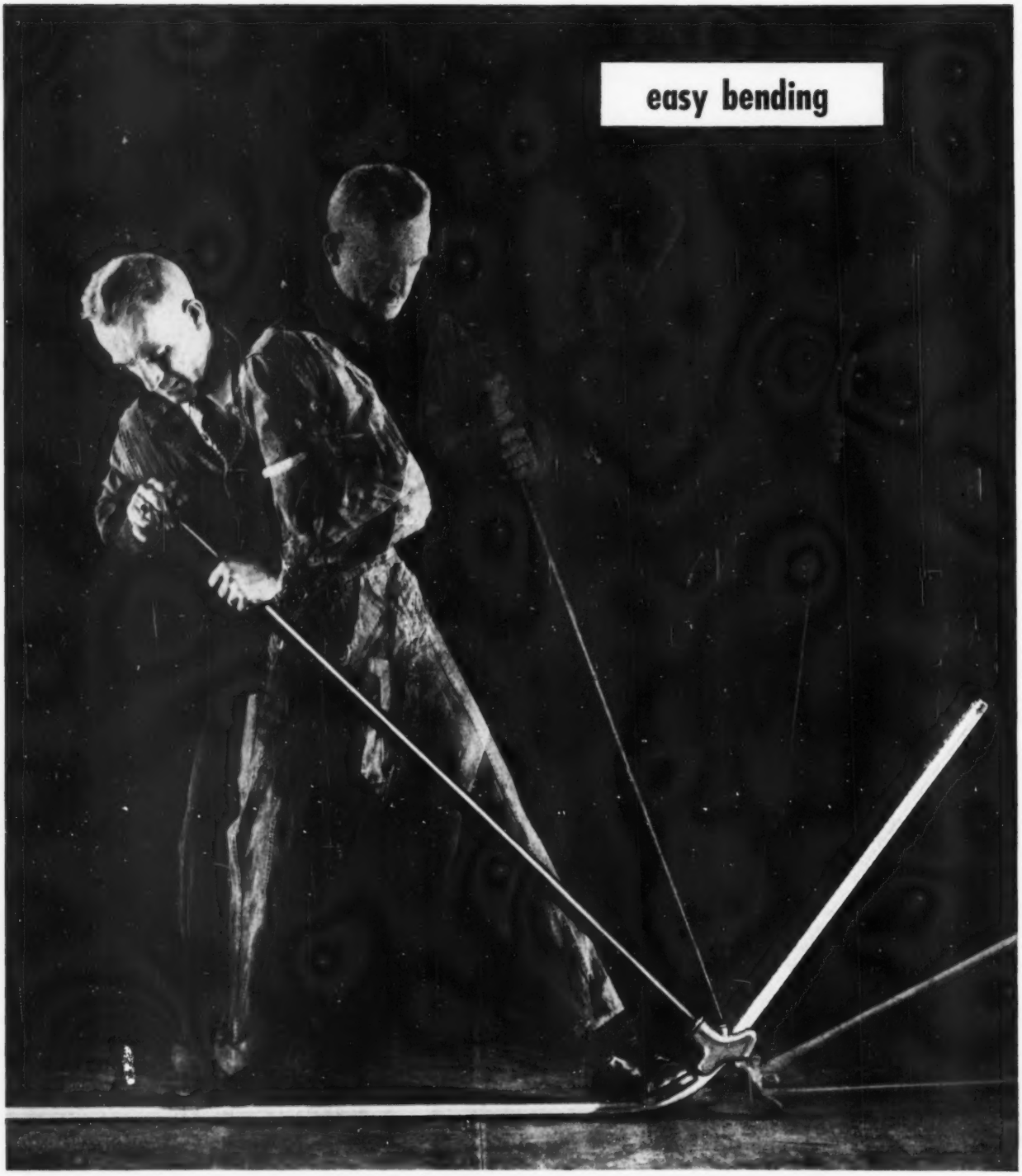
RACO
What these two signs mean to YOU
The sign of the Underwriters' Laboratories "U-L" stamped on an electrical box means that it has passed the exacting safety examination of that organization and thus will meet the requirements of your local building code. The RACO emblem on a box means that it was designed and is constantly improved to make installation faster, easier, and permanent. This well-known trade-mark on box materials is your assurance that they are adaptable to all wiring needs . . . are handy to use . . . are recognized by architects, engineers, and builders everywhere . . . and are available nation-wide. Look for these two signs . . . insist on them!
You can always rely on RACO
RACO
ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois
"A BOX FOR EVERY NEED"

G. E. announces



New G-E WHITE is easier to bend because the "metallizing" process eliminates the quenching and straightening that cause hardening.

new rigid conduit

Wire-pulling is easier because new G-E WHITE is lined with a new corrosion-resistant coating, containing an anti-friction agent. There is no roughness inside the conduit that might damage insulation.

A new G-E WHITE rigid steel conduit that has easy bending, easy wire-pulling, and improved corrosion-resistance characteristics has been introduced by General Electric's Construction Materials Division.

The result of an intensive research and development program, new G-E WHITE is now zinc-coated by means of a process called "metallizing." This process, while never before applied to rigid conduit, has been proved by more than 30 years of use on ships, pipelines, bridges, and trestles in damp and corrosive atmospheres.

In metallizing, pure zinc powder, reduced to a plastic state, is sprayed onto the conduit. This bonds a controlled, uniform coating of pure zinc to both pipe and threads to provide lasting protection against corrosion. Metallizing does not harden the conduit or form brittle zinc-iron alloy.

In addition to the metallizing process, a new anti-friction inside coating has been added to make wire-pulling easy . . . to provide permanent interior protection against corrosion.

The new G-E WHITE rigid conduit conforms with the American Standards Association specifications, is listed by Underwriters' Laboratories, Inc., and meets all U. S. Government specifications. Ask your distributor about the new G-E WHITE. Available in all size mixes. Section C24-818, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Photograph courtesy of Metallizing Engineering Co., Inc.

Better Corrosion Protection — The corrosion resistance of metallizing has been proved by 30 years of service, and by exhaustive tests in G-E laboratories. The hull and superstructure of the ship above depend on metallizing for protection against salt spray. The new G-E WHITE conduit has the added protection of a coating of C-553 lacquer over the metallized zinc.

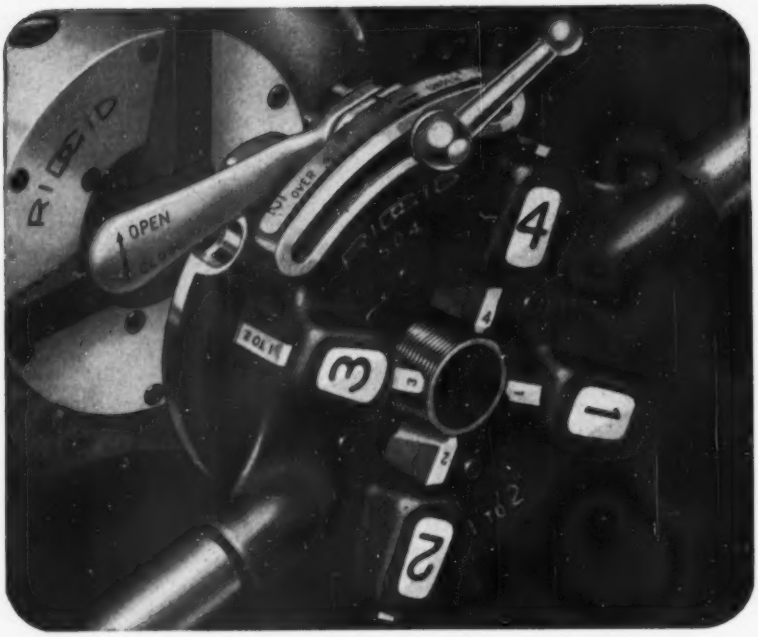
New G-E WHITE

1878 **75** 1953
YEARS OF ELECTRICAL PROGRESS

You can put your confidence in—

GENERAL ELECTRIC

NEW RIDGID
Quick-Opening
"504" CONDUIT THREADER
for Power Drive use



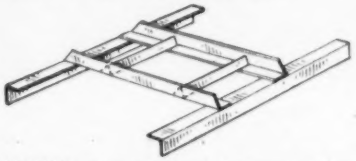
Threads 1" to 2" conduit with 1 set of dies

You can't beat this new "504" for fast smooth threading with power drive! Changes instantly from size to size regardless of position of quick-opening lever . . . Release ball handle, move indicator line to 1", 1¼", 1½" or 2" on size bar, tighten—it's ready to thread! Quick-opening handle retracts dies instantly without stopping power drive—no slow backing off. 4-jaw work-holder centers conduit for accurate threading. No lead screw to jam. Easy-to-read size bar. Adjustable to over and under size threads. See it, try it—buy new "504" at your Supply House.

THE RIDGE TOOL COMPANY • ELYRIA, OHIO

RIDGID
Work-Saver Pipe Tools

TONGS grip each reel as wire is raised or lowered by means of block and tackle rolling along overhead mono-rail which is welded to top front of 5-tier rack.



ANGLES with upturned flanges confine each reel laterally, while additional angles with both flanges turned down to form 45-degree stops are welded crosswise to prevent reels from rolling forward or backward.

DETAIL of single reel support indicates positioning of flanges. Each reel position is plainly numbered to facilitate accurate stock records and storage.

shelves. The larger reels are confined by angle iron cross members which run from front to back of the main supporting members, with the vertical flanges turned up to establish lateral limits for each space. Reels are prevented from rolling forward or back-

ward by shorter angles which are welded across the others with both flanges turned down, thereby forming 45-degree angle stops. Sketch shows details of this construction.

A block and tackle hoist rolls along an overhead monorail which is incorporated in the overall framework of the racks, and ice-tong grips are used to grasp the reels while they are being raised or lowered.

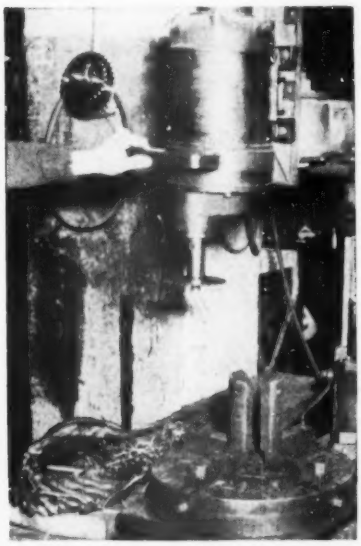
Racks are erected fairly close together to conserve floor area, yet aisles are sufficiently wide to permit a dolly to be moved freely into place when a heavy reel is to be shifted to a remote section of the shop.

Drill Press Used To Cut Coil Knuckles

Removing damaged coils from stators is facilitated in the shop of the Central Armature Works of Washington, D. C., through the use of drill presses fitted with cutting heads that may be used to sever coil knuckles prior to the pulling of old wire from slots.

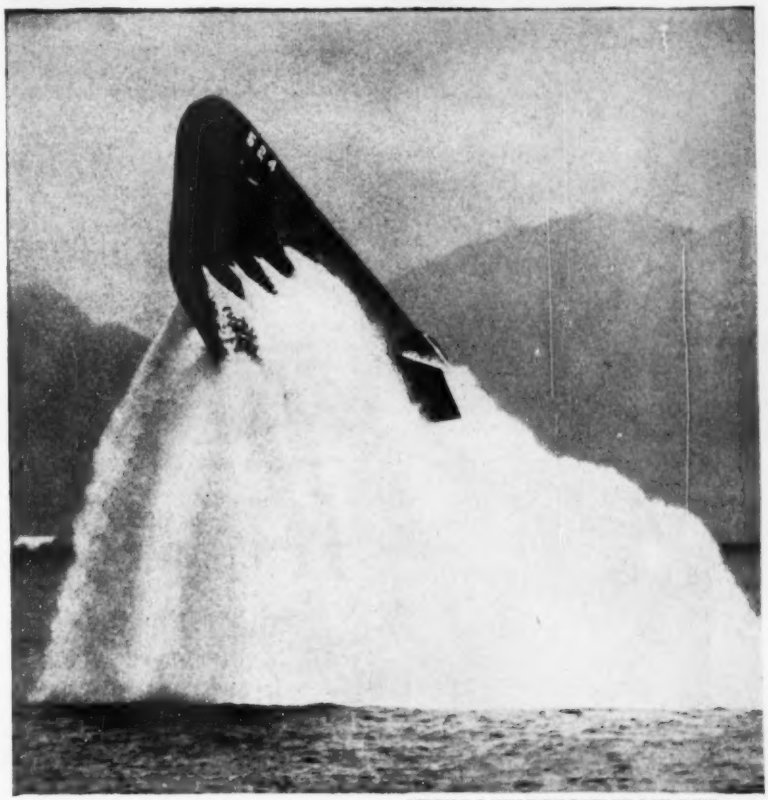
Cutting teeth are of a clover-leaf pattern since it has been found that conventional saw teeth rip and tear the coils rather than cleanly cut them. An assortment of blades makes it possible to select one that will approximate the internal diameter of the stator being cleaned.

An internal expanding base grips the stator to prevent it from rotating with the cutter or sliding from the press plate.



CUTTER with teeth of a clover-leaf pattern is used to sever knuckles of stator coils prior to pulling them from slots. Stators are prevented from rotating or sliding by internal spread base plate.

ELECTRO DYNAMIC
extra *dependable*



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UP FROM THE SEA comes fabulous Motor Stamina for Industry!

Over half a century of service aboard U.S. Navy submarines — *where dependability means life itself* — has bred tremendous stamina into ELECTRO DYNAMIC industrial motors. This inheritance of *extra dependability*, proved during years of gruelling duty under the sea, explains the amazing performance records being established by E.D. motors in industry today.

From 1 to 250 h.p.
(N.E.M.A. STANDARDS)

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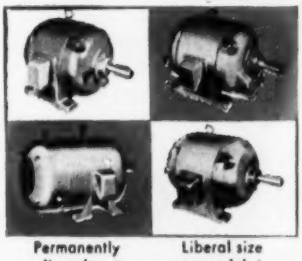
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Also a complete line of Direct Current motors and generators

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DIVISION OF GENERAL DYNAMICS CORPORATION
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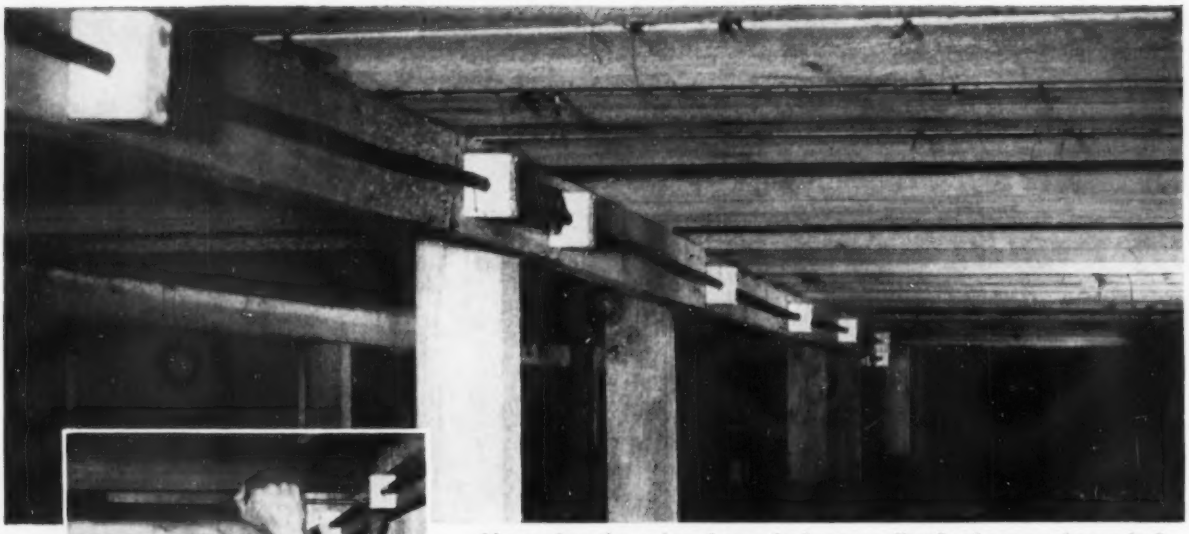

Above view shows how barn wire is strung directly above mushroom beds.

"Neoprene-jacketed wire can take the high humidity and 140°F. heat inside these mushroom sheds"

...says L. D. Miller, Electrical Contractor, Kennett Square, Penna.

"The area around Kennett Square is known as the 'Mushroom Center of the World'—so we're called on to do a lot of wiring for mushroom growers. And," continues Mr. Miller, "the temperature and humidity inside these mushroom sheds put any wire to the test!

"When the growing beds are being pasteurized, the shed is filled with steam and the temperature is held to 140°F. for seven days. The temperature is lowered to 55°F. during the 5-7 month growing period, but the humidity remains high. We've found that neoprene-jacketed barn wire really holds up despite years of exposure to these conditions.

"And in addition to resisting deterioration from heat and humidity, the neoprene jacket affords excellent protection against the organic fumes given off during pasteurization and the chemical spray used in fly control."

WHEREVER IT'S INSTALLED—above ground . . . in ducts or conduits . . . or buried direct in earth—neoprene-jacketed wire and cable can be depended upon to give long, trouble-free service. Your supplier is the man to see for more information about neoprene-jacketed cable. It's available in single and multiple conductor types and in voltage ratings to meet your requirements.

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In The News

1953 Construction Sets Record

New construction expenditures in 1953 will likely total $35 billion, up some $2 billion above the record set in 1952, and equal to or greater than the Commerce Department's prediction of last January. June expenditures were reported at $3.2 billion, 9% more than in May, and 8% above the $2.9 billion spent in June 1952. Total expenditures for the first half of this year were 8% above the first half of 1952, Commerce Department reports. Largest gains have been in commercial construction, and private industrial construction has remained at a higher level than was predicted at the end of 1952.

Housing starts during the first six months of this year were 577,100, compared with 565,800 in the first half of 1952, according to a Bureau of Labor Statistics report. But starts in May were less than in April, and starts in June dropped 4% below May totals. A sharp decline in public housing since March, plus difficulty in obtaining mortgage financing, has resulted in this slowdown, BLS announced.

Public housing will probably remain within tight limits until next June 30, end of the current fiscal year. Eisenhower asked for 35,000 units for the public housing program for this fiscal year. But Congress, with divided opinion on how many units should be built with public funds ranging from none to the Administration's 35,000 unit request, is expected to settle for about 20,000 low cost units with the provision that these must come from contracts already entered into by Government.

Continuation of federal aid to states for hospital plans and construction to June 30, 1957, two years beyond present legislation was proposed in a bill recently passed by the House and sent to the Senate.

Hourly union wage scales in the building trades have advanced approximately 28% above the 1947-49 3-year average at the end of March, BLS reported. This report shows an average hourly wage scale of $2.62 on April 1, 1953, or 33 cents and 41 cents above the levels on July 3, 1950 and January 3, 1950 respectively. During the second quarter of this year these union wage scales rose another 2.6%, with increases ranging from 10 cents to 15 cents per hour. Seven building trades are covered in these reports, based on 85 cities across the country, and are: bricklayers, carpenters, electricians, painters, plasterers, plumbers, and building laborers.

Electricians registered the greatest gain during 1953's first quarter, latest period covered by the report. Increases averaged 1.6 cents an hour for all workers in this group. Over a third of the increases amounted to either 10 cents or 12.5 cents an hour; one of every six was 7.5 cents; and a similar proportion was 15 cents an hour.

The rate level on April 1, 1953 was: low (Portland, Me.)—$2.16; average —$2.94; and high (Newark, N. J.)—$3.45.

Union scales are the minimum wage rates agreed upon through collective bargaining between employers and trade unions, according to the BLS report. Overtime beyond established maximum daily and weekly hours is excluded from the summary. The scales do not reflect either rates for apprentices or premium rates; thus, they do not represent total hourly earnings of union labor, BLS points out.

ELECTRICAL CONTRACTORS George H. McKee, Mt. Vernon, C. C. Nash, Whiffen Electric Co., White Plains, J. Domizio, Domizio & Everets, Yonkers, Dave Cockburn, Port Chester, and H. G. Martin, Yonkers, attended NECA district No. 1 meeting at Groton, Conn.

New Standards For AC Motors

New broad standards allowing more horsepower to a frame size for all of the popular high production alternating current type electric motors from 1 to 30 hp, were announced recently by C. O. Hedges, Chairman of the Motor and Generator Section of the National Electrical Manufacturers Association, in a meeting with representatives from the automotive and machine tool industries.

The advent of superior synthetic insulating materials, new and better silicon steels and improved techniques as well as real advances in the art of motor design, are cited as developments which permit packing more horsepower into electric motors for a given size and space.

"The new motors," Mr. Hedges declared, "will continue to satisfy fully the performance standards of torque, temperature rise, and starting current limitations as before. These standards, while using a fewer number of frame sizes to cover this range of horsepowers, retain the previous frame numbering system.

"Complete data on derivatives, types of mountings, etc., are now available as a result of the Section's approval of its committee work. Frame assignments have been made to cover the 2-through 12-pole speed ratings for the open and the totally-enclosed fan-cooled types.

"As in the past, the standards have been laid out to afford maximum interchangeability between the totally-enclosed fan-cooled ratings and the open-type ratings by utilizing the same horsepower-frame relationship as far as possible.

"In this re-rating program," he continued, "for a while there will be some industrial users of electric motors who will have to stock additional renewal parts and, perhaps, additional spare motors during the transition period. But, more horsepower for a given size, lower space and storage costs, more economical mounting platforms, and easier installation and maintenance are advantages of the change-over which will shortly out-weigh all other considerations."

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Serving the Electrical Industry

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"For the electric motor manufacturers", he pointed out, "the new standards, for the first time in 25 years, offer an opportunity to make full use of new techniques and technological advances. However, the new program, for them, involves a substantial amount of engineering, development, testing, and retraining of factory personnel, as well as changes in production facilities and techniques. Therefore, it is estimated that the first of the new motors should become generally available early in 1954. Naturally, each company will determine and announce when its motors, built to the new standards, will be ready."

N. Y. State Contractors Meet At Saranac Inn

The responsibilities of management and labor in a free economy was the theme of the 54th annual convention of the New York State Association of Electrical Contractors and Dealers, Inc., held at Saranac Inn, N. Y., June 29 to July 3. Approximately 400 members and guests attended.

A. Lincoln Bush, New York, was chairman of the opening session, which was Contractors' Day. W. F. Patterson, director of the Bureau of Apprenticeship, U. S. Department of Labor, stated that both management and labor have important stakes in the success of apprenticeship. By working together, industry and government can combine the best ideas of each in producing a sound, efficient program of industrial training—one that will rebound to the benefit of both employer and employee and eliminate a deplorable waste.

"Management and labor stand today at the pinnacle of economic power. Where we go from here depends on the ability of both management and labor to get along on a basis of equality, said S. J. Cristiano, field director, Eastern Region, NECA. When this equality is thrown out of balance, uneconomic restrictions that are detrimental to our industry are usually the result.

SPEAKERS at New York State Contractors' Convention at Saranac Inn were W. A. Lyons, Binghamton, A. Lincoln Bush, New York City and Garth A. Shoemaker, Albany.

W. E. HENGES, president, Graybar Electric Co. and Ralph M. Darrin, commercial vice president, General Electric Co., during the New York State Electrical Contractors' convention at Saranac Inn, N. Y.

Walter O. Zervas, research engineer, American Iron and Steel Institue, discussed the use of steel in electrical distribution systems. He presented a demonstration board, which illustrated safety in electrical equipment grounding, the protection of wires against mechanical injury, the safe containment of accidental sparks within the enclosure, and the relative ease of re-wiring a pull-in-pull-out system to assure adequate capacity for the future. Mr. Zervas hopes to make this board available for use at local group meetings.

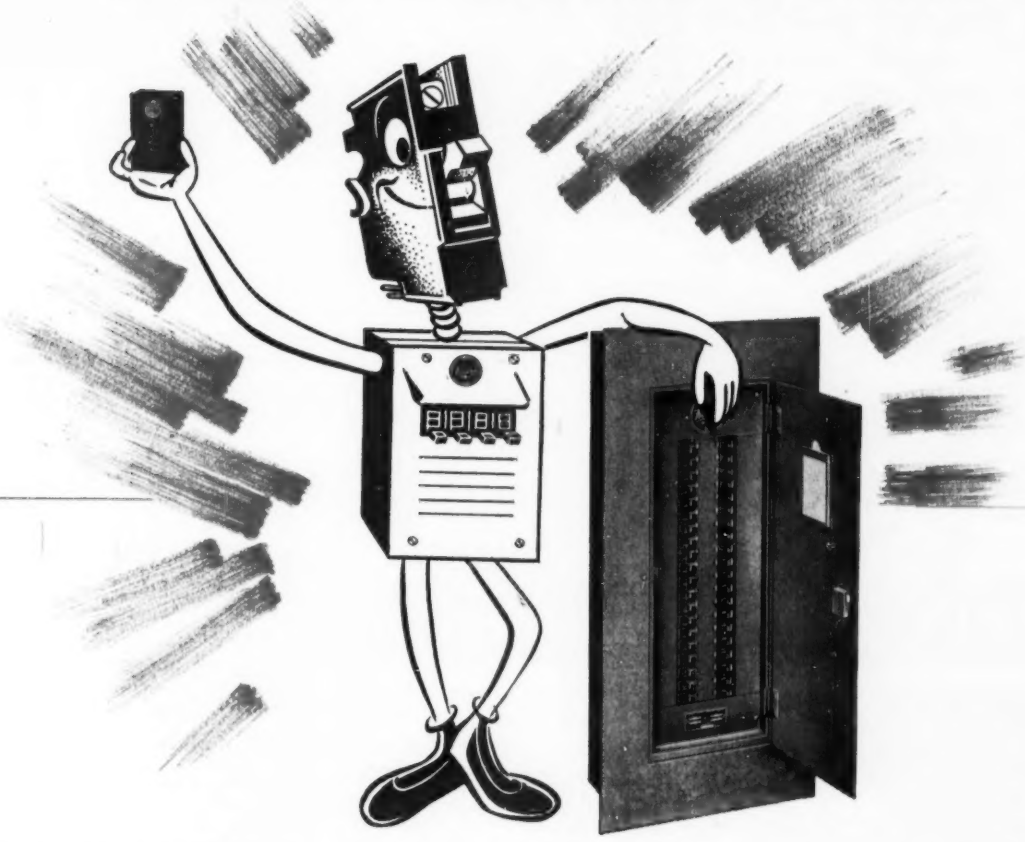
James D. Lynett, state superintendent, Bureau of Electricity, New York Board of Fire Underwriters, spoke on the inspector's position under the new economy, and Thomas G. Gorman, the State Insurance Fund, discussed workmen's compensation.

Utilities Day was chairmanned by William A. Lyons, vice president, New York State Electric & Gas Corp. Harris E. Dexter, vice president, Central Hudson Gas and Electric Corporation spoke on why we need leadership in business and management's responsibility for developing leadership. In good leadership, he said, the ability to get along with people is 60% of a person's success, whereas technical knowledge is rated at 40%. Other speakers at that session were Garth A. Shoemaker, president, Citizens Public Expenditure Survey, Inc., Rob Roy MacLeod, commercial manager, Niagara Mohawk Power Corp., and E. R. Schramm, Consolidated Edison Company.

Ralph M. Darrin, commercial vice president, General Electric Co., was chairman of the Manufacturers and Wholesalers Day. Steadily improving selection procedures are gradually eliminating the "apple polishers, the buck passers, and the credit stealers" from industrial supervisory positions,

WE DARE YOU!

Just try to stump the Stab-lok® System with any logical combination of circuit breaker requirements



ONE CIRCUIT or 20 circuits... add range and hot water heater! You can't find a sensible specification for circuit breaker protection that the sequence bussed Stab-lok can't meet with ease, speed and economy!

Electric radiant heating? Stab-lok LA2600 takes that in stride. A 42-circuit panelboard? You can assemble it in minutes, from your distributor's stock. Single phase or 3 phase, 4 wire? Stab-lok gives you a real choice.

Stab-lok's *complete* range of enclosures meets all needs, even for special applications. With 3MBA, for instance, you can convert a multi-breaker into a Stab-lok in next to no time. Most enclosures are the Noark flush-surface type and practically cut your stock requirements in half.

Last, but not least, the Stab-lok system slashes installation costs. Enclosures have ample wiring space... backplate is removable for wire pulling ...all components are accessible. Write for the whole Stab-lok story... and order Stab-loks from your distributor today.

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Saves time, money, labor in electrical, heating, plumbing, air conditioning installations—both construction and maintenance. Sets studs in steel or concrete in seconds—just load, position, fire—job done. Integral cartridge eliminates matching and fitting, and interchangeable barrels permit driving of either ¼ or ⅜-in. studs with same firing unit. Solid head, internal or external threaded type studs available. Permanent spall-shield aids safety. Spring loaded safety arm and center-fire cartridges avoid accidental discharge, and assure right load for the job. Write for details.

◄ For close-to-the-wall jobs, section of spall-shield can be lifted, and turned out of the way.

Still available—model with separate spall-shield. ►

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MEETS STANDARDS OF AIEE-NEMA

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*If you think this is just an advertising adjective we invite you to contact us . . . we will tell you who buys Magnatran —the better transformers . . . and if you want, show you how we build them.

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MAGNATRAN ®

LOUIS FREUND, New York City, and W. F. Patterson, director of the Bureau of Apprenticeship, Department of Labor, Washington, attended the convention of the New York State Electrical Contractors.

said Willard V. Merrihue, manager, Employee Relations Department, General Electric Co. He warned against picking supervisors too much on the basis of their technical know-how, and giving them too little training in fulfilling human needs and in selling the merits of the job. He urged that supervisors themselves be given greater job satisfaction and better training in selling the merits of the individual employee's job to the employee.

Willard E. Henges, president, Graybar Electric Co., stressed the importance of selling in today's distribution set up and pointed out the need for sales organizations by electrical contractors.

Frank G. Graf, Eastern agency and construction manager, Westinghouse Electric Corp., stated that good corporate citizenship is particularly important to business today. A good corporate citizen will encourage its employees to take an active part in the many professional and technical societies that are available. Fred W. McChesney, manager, Industrial Sales Procedures, Apparatus Sales Division, General Electric Co., discussed the continuing electrical revolution.

At the business session the present officers were re-elected—R. J. Knoblock, Syracuse, president; W. L. Drexler, New York, 1st vice president; H. F. Janick, Rochester, 2nd vice president and secretary; and James F. Burns, Schenectady, treasurer.

NISA News

"Rhode Island Day" was held June 12 by the New England Chapter with inspection of two Pawtucket and three Providence shops during the afternoon, followed by cocktails, dinner, business meeting and entertainment at Johnson's Hummocks Grill, Providence.

Alfred C. Elson, Jr. NISA director from New England, addressed his Chapter on the occasion of the 50th

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V-124A—24″
Bucket Blade
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Exhaust Fan

RUGGED—Heavy duty, totally enclosed capacitor type, ¼ H. P. motor. Welded angle steel frame—flange mounting. Reinforced welded steel blade assembly.

ADAPTABLE—Thrust bearings permit horizontal or vertical mounting. Conduit box on rear motor cover for easy accessibility. Two speed, push button industrial switch.

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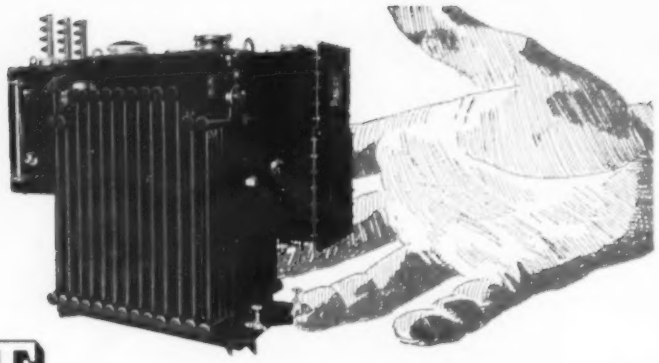

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REPRESENTATIVES IN PRINCIPAL CITIES

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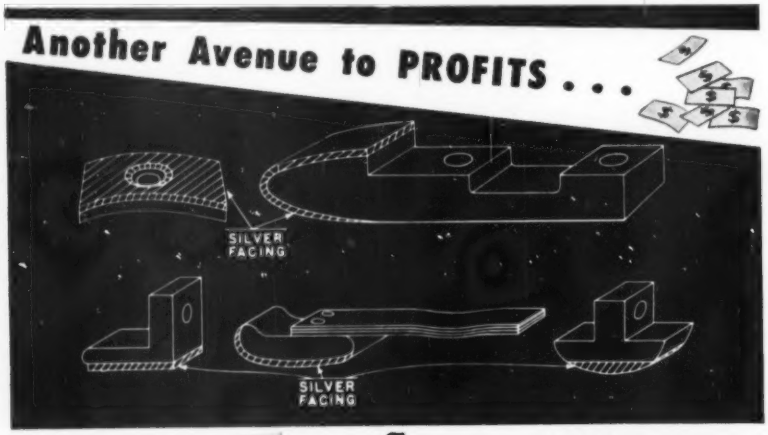

Save Money for your Customers, too—

HAVE SUPERIOR *"Silver-face"* THEIR CONTACTS

Worn silver contacts start their lives all over again when re-faced by the Superior factory method. *Cost?* Compares favorably with that of a new contact. *Service?* Longer than the original copper contact. A bargain for your customer, and more business for you!

SUPERIOR CARBON PRODUCTS, INC.
9114 George Avenue • Cleveland 5, Ohio

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Since 1919 **Superior** CARBON BRUSHES

FIFTIETH ANNIVERSARY was celebrated by New England Machine & Electric Co., Pawtucket, R. I., on June 15th. Alfred Elson, Jr. (center), president and treasurer, reviews historical record with vice presidents Walter L. Kelley, Jr. (left) who supervises sales, and Alfred H. Sparn who supervises the electrical construction department. The company held open house for customers and suppliers, for which affair nearly 500 registered.

anniversary of his company, the New England Machine & Electric Co., Pawtucket, R. I. About 130 persons attended.

• • • •

Chicago's Central District Chapter met June 9th for dinner and to hear a representative of Wagner Electric Corp., St. Louis, talk on increment motor and starter combination. A report on the New York 20th Anniversary Convention was also made to the group.

• • • •

The Quaker City Chapter met on June 26th at Lu Lu Country Club, Philadelphia, for its Annual Dinner and Ladies' Night. New officers were introduced as Sam Augustine took over the chapter presidency from Bill Engel.

• • • •

NISA's Los Angeles Chapter met June 9th for a cocktail and dinner party, sponsored by Insulation and Wires, Inc. Members heard discussions of new NEMA standards as they affect manufacturers and repairmen. Paul Borek led a discussion period following the talks.

• • • •

The Virginia Section of the Southeastern Chapter held its spring meeting in Richmond, Va. May 16th in the Jefferson Hotel's Monticello Room. Total attendance was 22. John Overton, Electric Motor & Repair Co. Richmond, spoke on "Mechanics of NISA and Its Organization and Functions." Troy K. Preddy of the same company talked on maintenance and repairs and dc motors, and Irving Hundley, Wingfield & Hundley, Rich-

ROYAL
POWR-
HEAVY-DUTY

...take the current where the tools go!

Only "POWR-KORD" offers the complete safety of MOLDED-ON attachments...every component part fully UL listed

Have you had a sample of ROYAL-LAG time-delay PLUG FUSES?
Write for a sample and literature

mond, added his thought to Preddy's paper. J. R. Shearon, Electric Equipment Co., Richmond, spoke briefly on the importance of rebuilding used equipment to NISA standards. H. I. Lamb, Electrical Equipment Co., presented his firm's pension plan.

• • • •

Gordon O. Toms of the G. O. Toms Electric Co., Spokane, Washington landed his Navion aircraft in Flushing Field near New York's La Guardia airport May 25th a few hours after the 20th Anniversary Convention was under way at the Hotel Statler.

Mrs. Toms accompanies her husband on these convention trips, helping with the navigating.

• • • •

New San Diego Chapter officers include: president, Ballard C. Beekman, California Electric Works, San Diego; vice-president, Ted Cluts, Tri-Electricians, El Cajon, Calif.; and secretary-treasurer, Oliver E. Seeman, Ets-Hokin & Galvan, San Diego.

• • • •

Benson Brother Open New, Larger Repair Shop. Benson Brothers, Culver City, Calif. moved March 23rd from 3830 Cardiff Ave. to new and larger quarters at 9314 Venice Blvd.

Wilson Electric Co. Inc. Macon, Ga. has moved from 549 Pine St. to 557 Pine St.

Henry F. Hurley Electric Co., Detroit, moved recently to a new, larger building at 1847 W. Bethune. The firm formerly was at 944 West Warren.

Chattanooga Contractors Fined

Fines totaling $16,500 have been assessed against an electrical contractor-labor group in Chattanooga, Tenn., on charges of conspiring to violate the anti-trust laws.

The federal indictment against the Chattanooga chapter of the National Electrical Contractors Association, Inc., Local 175 of the International Brotherhood of Electrical Workers, and several local firms and individuals charges the group "rigged" bidding on electrical contracts and that the union refused to furnish labor to those who did not comply with the "selected bidder system."

A plea of nolo contender was entered by nine of the defendants when arraigned before Federal Judge Leslie R. Darr. Judge Darr commented that "this seems a flagrant case of choking out trade in the Chattanooga area."

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EXTENSIONS

- MOLDED-ON CAPS AND CONNECTORS
- FOR PORTABLE TOOLS (indoor and outdoor), LIGHTING, TEMPORARY INSTALLATIONS, MACHINES, etc.
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Ask your ROYAL wholesaler for the "POWR-KORDS" that fit your requirements, and

USE THEM ON EVERY JOB!

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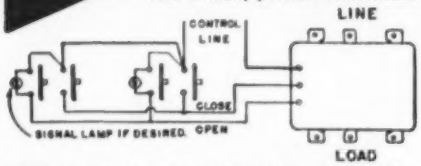
ROYAL ELECTRIC CO., Inc., PAWTUCKET, R. I.

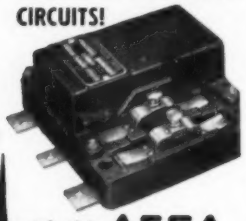
Suggestions from ASCO
Headquarters for Electromagnetic Controls

This Typical Circuit
(one of many possible control schemes)



ASCO Remote Control Switch (push button control)
Any Number of Stations Permissible

SAVE ON MODERNIZATION OF POWER and LIGHTING CIRCUITS!



with this ASCO Mechanically Held Remote Control Switch

Gives You These 4 Proved Remote Control Switch Advantages

1 **Economy in Installation** — Distribution panels can be located to provide straight feeders and short branch circuits, resulting in minimum line drop and losses.

2 **Convenience in Control** — Control Stations may be located at convenient points and connections made with small wires. For example with a 60 Ampere Switch at 110 volts, #12 wire may be run 750 Feet! Instant disconnect of lighting and power feeders may be made from convenient locations.

3 **Simplicity and Flexibility in Design** — Design can be determined by logical distribution rather than accessibility of control. This makes wiring layout simple, and flexible for future expansion.

4 **Safety in Emergencies** — Vital circuits may be controlled instantaneously from one or more readily accessible locations.

ASCO Remote Control Switches are unaffected by line voltage conditions. No A-C hum — the solenoid coil is energized only during the instant of operation.

Write us about your requirements. ASCO Remote Control Switches range from 30 to 1000 amperes, 2 to 24 poles, 110 to 750 volts. A-C and D-C; may be double throw; open or enclosed.

ASCO Electro-Magnetic CONTROLS

Automatic Switch Co.
385 Q LAKESIDE AVENUE · ORANGE, NEW JERSEY

7 out of 10 JOBS can use Revere ELIPTORS

- Wide Choice of Horizontal or Vertical adjustments.
- Degree Marked for Accurate Setting.
- Accommodates 300 to 1500 Watt GS or 750-1000 Watt Bi-Post Lamps.
- Offer Two Distinctive Beam Spreads.
- All Adjustments on Right Side for Safe, Convenient Servicing.
- Easy to Wire and Maintain.

FOR THE FINEST IN FLOODS CHOOSE Revere

Are you acquainted with the complete REVERE line? You'll find exactly what you need for the job you are working on and save a lot of time shopping around. And, you can bank on REVERE construction—it's sturdy and will render many years of service. Write us today.

REVERE ELECTRIC MFG. CO. 6017 BROADWAY CHICAGO 40, ILL.
INDOOR & OUTDOOR LIGHTING FOR EVERY NEED

THE OTHER THREE CAN USE

750-1000-1500 WATT ENCLOSED FLOODS

18 and 20 in. REAR SERVICE FLOODS

"ENDOVAL" MERCURY VAPOR LUMINARIES

300 to 1000 WATT ENCLOSED FLOODS

AREA LIGHTERS WITH TOP FLOODS

DATES AHEAD

Illuminating Engineering Society — Hotel Commodore, New York, N. Y., September 14-18.

International Association of Electrical Inspectors — 25th Jubilee meeting, Edgewater Beach Hotel, Chicago, Ill., September 21-26.

Canadian Electrical Manufacturers Assn. — Annual meeting, General Brock Hotel, Niagara Falls, Ontario, Canada, September 23-25.

National Electronics Conference—9th Annual conference, Hotel Sherman, Chicago, Ill., September 28-30.

Second National Electrical Industries Show—Sponsored by the Eastern Electrical Wholesalers' Association, 69th Regiment Armory, 26th St. & Lexington Ave., New York, N. Y., September 29-October 2.

Industrial Electric Exposition — Hotel William Penn, Pittsburgh, Pa., October 6-8.

Electrical Progress Show—Convention Hall, 34th below Spruce Sts., Philadelphia, Pa., October 13-15.

New York State Apprenticeship Council—Conference at St. George Hotel, Brooklyn, N. Y., October 28-30.

National Electrical Manufacturers Assn.—Haddon Hall Hotel, Atlantic City, N. J., November 9-12.

National Electrical Contractors Association—Annual convention, Miami Beach, Florida, November 17-20.

National Rural Electric Cooperative Assn.—National convention, Miami, Florida, Jan. 11-14, 1954.

American Institute of Electrical Engineers—Winter general meeting, New York, N. Y., January 8-12.

National Electrical Manufacturers Assn.—Edgewater Beach Hotel, Chicago, Ill., March 8-11.

National Association of Electrical Distributors—Annual convention, Atlantic City, N. J., Week of June 6.

IES PRESIDENT Everett M. Strong (center) congratulates Glenn E. Park, General Electric Lamp Division, Charlotte, N. C. on his election as incumbent Southern Regional Vice President, as R. C. Pasley, Louisiana Power and Light Co., who has served as Vice President for the Southern Region for the past two years, looks on. Mr. Park takes office October 1 this year.

Among the Manufacturers

Headquarters Announcements

W. H. Brady Co., Milwaukee, Wis.—Westley J. Tuite, general sales manager.

General Electric Co., Lamp Div., Nela Pk., Cleveland, Ohio—T. M. Wallace, Lamp Mfg. Dept., Nela Pk.; A. D. Dixon, manager, Lexington, Ky., Lamp Works; T. A. Glidden, manager, Ohio Lamp Works, Warren, Ohio; J. W. Wright, manager, Bucyrus, Ohio, Lamp Works; John H. Ronayne, advertising staff, Lamp Div., Nela Pk.

Philadelphia Electrical & Mfg. Co., Phila., Pa.—Leon Brown, chief project engineer; Harry L. Weid, factory manager.

Thor Power Tool Co., Aurora, Ill.—J. A. Hill, vice president and sales manager; John A. McGuire, vice president in charge of labor relations; B. H. Johns, vice president in charge of rock drill sales; W. B. Hunn, vice president in charge of Los Angeles Works.

General Electric Co., Apparatus Sales Div., Schenectady, N. Y.—O. B. Falls, Jr., manager of electric utility sales; T. F. Mackey, manager of heavy industries sales; W. V. Gough, manager of light industries sales; H. R. Wallrath, manager of contractor and construction industries sales; A. H. Henker, manager of industry products maintenance; F. W. McChesney, manager of industry sales procedures; Bruce M. Robertson, manager of finance; William F. Oswalt, general manager, General Purpose Control Dept.

Clarostat Mfg. Co., Inc., Dover, N. H.—Jacobs J. Repetto, assistant sales manager.

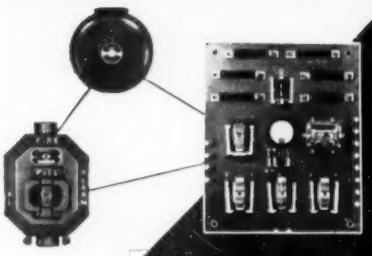
General Electric Co., Motor & Generator Div., Erie, Pa.—Oscar L. Dunn, general manager; Paul D. Ross, manager of marketing; Richard M. Hartigan, manager of employee relations; Paul S. Stough, manager of engineering; Louis E. Wengert, manager of finance; Francis J. Boucher, manager of manufacturing.

S & C Electric Co., Chicago, Ill.—John J. Mikos, chief design engineer; John S. Ferguson, administrative engineer; Jack B. Castle, application engineer; Donald R. Franzmann, applications engineer.

General Dynamics Corp., Electro Dynamic Motor and Generator Div., Bayonne, N. J.—William G. Hill, sales engineer.

Reliance Electric and Engineering Co., Cleveland, Ohio—Hugh D. Luke, manager, Manufacturing Dept.; James

Interior Fire Alarm Systems



coded and non-code types

Complete reliability is the one thing we demand from a fire alarm system. Therefore, when ordering Interior Fire Alarm Systems, be sure to specify equipment (control panels, stations, and fire alarm bells) produced by Signal Engineering & Manufacturing Co., the originators of A-C Fire Alarm Systems.

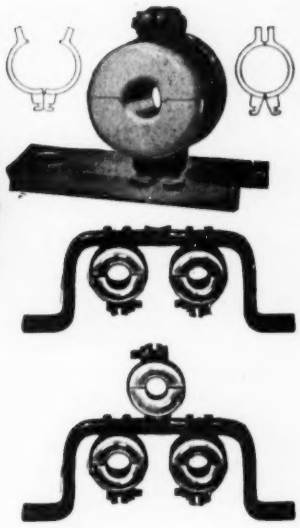
Both coded and non-code types are available in various arrangements depending on type of building or establishment. Although Interior Fire Alarm Systems are intended primarily for warning occupants of a building, they can be connected into a municipal system.

Engineering representatives in principal cities are available to assist in specifications.

Write for Bulletin FA-3

Wheelock FIRE ALARM SIGNAL
ENGINEERING & MFG. CO.
154 WEST 14TH ST. NEW YORK 11 N.Y.

For QUICK, EASY, SAFE Cable Installation
"EFFICIENCY"
NESTED
CONDUCTOR RACKS



Efficiency Nested Conductor Racks are simple, compact and are scientifically designed to carry conductors equidistant from center to center. One bolt supports the bushing, and clamps the bushing support to the frame. Available in 2-3-4-5 and 6-bushing racks.

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ELECTRIC AND MANUFACTURING CO.
MANUFACTURERS OF EFFICIENT ELECTRICAL DEVICES FOR CONDUIT, WIRE AND CABLE SUSPENSION
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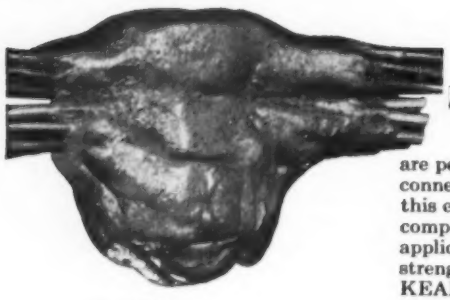

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are permanently sealed out of every connection that is protected by this easy-to-use, hand-moulded compound. Even on underground applications, the high dielectric strength and chemical stability of KEARNEY AIRSEAL give ageless, tight-sealing protection and insulation.

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For Better Construction *SAFER* Maintenance

Clean!

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5-in-1 OUTFIT

SOLDER-BRAZE

Eliminate time-wasting and costly cleanup with this air-acetylene outfit. Its flame is clean, hot, easy to handle. One flick of the thumb gives instant working heat. No smoke, fumes, soot, or stain. One handy kit takes care of all of your soldering, heating, and light brazing requirements. See your LINDE Jobber today. Or write LINDE AIR PRODUCTS COMPANY, a Division of Union Carbide and Carbon Corporation, 30 E. 42nd Street, New York 17, N. Y. In Canada: Dominion Oxygen Company, Limited, Toronto.

Four stems and a soldering iron handle every type of work. Fully adjustable pressure regulator permits exact flame adjustment for each soldering job.

Get it from your LINDE jobber.

The term "Prest-O-Lite" is a registered trade-mark of Union Carbide and Carbon Corporation.

A. Brandt, assistant manager, Manufacturing Dept.; A. S. Tusin, superintendent, Ashtabula, Ohio, plant; Robert B. Adams, night superintendent, Ashtabula Plant; Henry C. Dettenmayer, production manager, Ashtabula Plant.

Duro-Test Corp., North Bergen, N. J.—Donald H. Gardner, chief incandescent engineer.

General Electric Co., Power Transformer Dept., Pittsfield, Mass.—Louis S. Cusato, manager of employee relations; Carl A. Beers, manager of communications.

Keps Electric Co., Pittsburgh, Pa.—Bernard Braverman, manager of Lamp Dept.

Appleton Electric Co., Chicago, Ill.—Frank W. Wehrheim, general sales manager.

General Electric Co., Lighting and Rectifier Dept., Lynn, Mass.—W. Blake Miller, manager of employee relations; Robert E. Burroughs, manager of rectifier engineering.

United States Rubber Co., New York—Warren A. Tipton, general sales manager.

General Electric Co., Welding Dept., Fitchburg, Mass.—Charles L. Helms, manager of marketing administrative practices; Austin Hiller, manager of marketing analysis and planning research; Austin Leach, manager of renewal parts.

Westinghouse Electric Corp., Pittsburgh, Pa.—Clyde S. Gischel, general manager of consumer products.

General Electric Co., Chemical Div., Pittsfield, Mass.—Emmett E. Hinson, Jr., manager of industrial laminates and insulating materials sales.

Curtis Lighting, Inc., Chicago, Ill.—Darwin Curtis, president and treasurer; Ward Harrison, chairman of the board; George Gilleard, secretary.

General Electric Co., Major Appliance Div., Louisville, Ky.—Paul A. Wassmandorf, advertising manager; John G. Porter, manager of Home Bureau.

Sunbeam Lighting Co., Los Angeles, Calif.—Joseph L. Noveski, national sales manager.

General Electric Co., Construction Materials Div., Bridgeport, Conn.—Arnold Jenesen, manager of conduit standard lines sales.

Keystone Mfg. Co., Centerline, Mich.—Arthur McKinley, general sales manager.

General Electric Co., Air Conditioning Div., Bloomfield, N. J.—K. F. Houseman, manager of manufacturing, home heating and cooling plant, Trenton, N. J.

Rome Cable Corp., Rome, N. Y.—John H. Dyett, executive vice president; Gerard A. Weiss, secretary.

Pyle-National Co., Chicago, Ill., has acquired all tools, dies and equipment of M. B. Austin Co., Norbrook, Ill.

F. W. Wakefield Brass Co., Vermilion, Ohio, announces the formation of Wakefield Lighting Limited, London, Ontario.

General Lamp Mfg. Corp. of Elwood, Ind., has purchased the Van Dyke Lamp Div. of Van Dyke Industries Inc., Chicago, Ill.

Thor Power Tool Co. is the new name of the Independent Pneumatic Tool Co., Aurora, Illinois.

Ender Mfg. Corp. and Monarch Lighting Fixture Corp., both of New York City, have merged to form the Ender-Monarch Corp. at 50 Sylvester St., Long Island, N. Y.

Ettco Wire & Cable Corp. is the new name of Eastern Tube & Tool Corp., 75 Onderdonk Ave., Brooklyn 37, N. Y.

Regional Appointments

NEW ENGLAND

Appleton Electric Co.: Daniel C. Wing, sales engineer.

General Electric Co., Apparatus Sales Div.: A. J. Moore, manager of sales; A. Splittberger, manager of apparatus and component products sales; O. J. Schopp, manager of agency and distributor sales; J. P. Patton, manager of the Providence, R. I., office; A. R. Whenman, manager of electric utility sales, Boston office; R. P. Rice, manager of industrial sales, Boston office, E. S. Gunn, manager of transportation sales, Boston office.

MIDDLE ATLANTIC

Sterling Electric Motors, Inc.: John C. Ringland, manager of new sales office in Rochester, N. Y.

W. H. Brady Co.: Joseph I. Stone, eastern district manager, Newark, N. J.; Paul J. Leonard, mideastern district representative, Philadelphia, Pa.

Jacksonville Metal and Plastics Co.: Marshall V. Ledwick, sales representative, New York office.

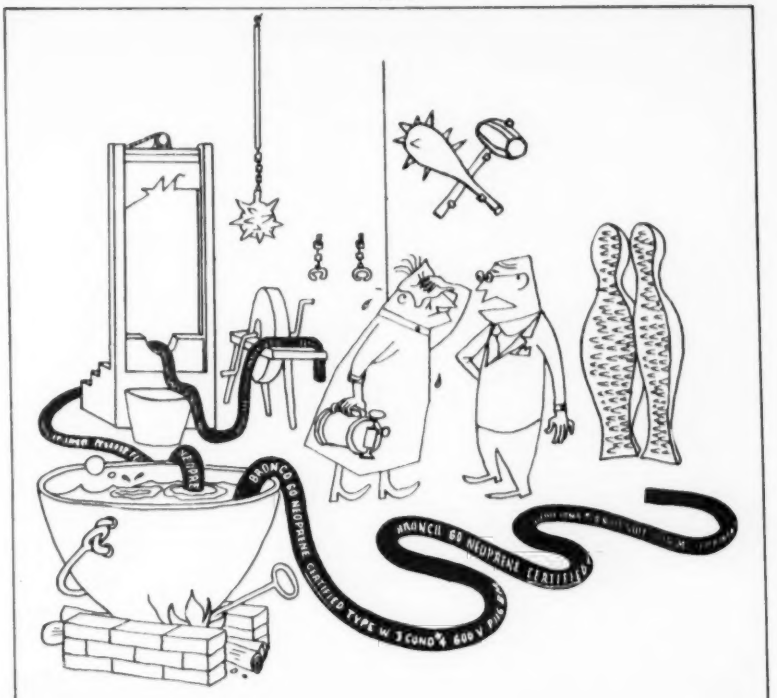
Ward Leonard Electric Co.: Leonard H. Wurzel in charge of Pittsburgh district office.

Barber-Colman Co., Automatic Control and Uni-flow Div.: K. C. Watson, manager of new Syracuse branch office.

General Electric Co., Apparatus Sales Div., Empire District: R. A. Osborne, manager of sales; H. C. Lindberg, manager of engineering; L. C. Brown, manager of finance; E. H. Aussicker, manager of apparatus and component product sales; W. A. Biser, manager of agency and distributor sales; B. J. Firkins, manager of advertising and sales promotion; W. F. Rauber, manager of the Buffalo office; J. D. Hershey, manager of the Rochester office.

General Electric Co., Apparatus Sales Div., New York District: H. A. Davis, manager of sales; A. M.

ADV.



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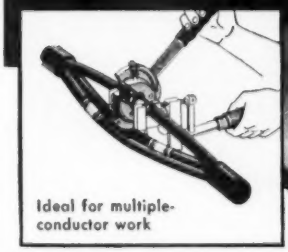
QUICK, PERMANENT SPLICES WITHOUT HEAT OR DIE CHANGE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Long-lasting Insul-Lock connectors and the new exclusive Insul-Lock Crimping Tool are all you need to make fast, permanent splices—anywhere, anytime, on conductors from #4 through 500 MCM. No dies to change—tough, lightweight, adjustable Crimping Tool does it all! Takes just seconds for a full circumferential crimp on any Insul-Lock terminal lug, splicing connector, cable tip or tee. Tool is fully hand operated, has easy rachet action, is ideal for tight spaces. Insures connections with maximum current capacity and mechanical strength. *Bench-type production tools also available.*

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- Creamy, non-corrosive lubricant. Never greasy or messy.
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- Does not run back on cables.
- Never harmful to hands or clothing.
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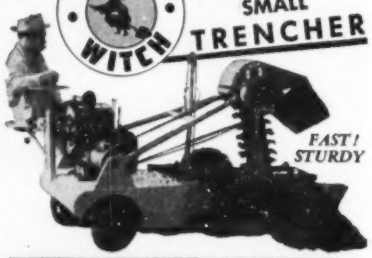
DITCH WITCH
World's Best SMALL TRENCHER



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Digs 2" to 6" Trenches
Any Depth to 36"

A self-contained ditcher operating under its own power—digs clean even 2" to 6" trenches to a 36" depth. Light weight, mobile, low operating and maintenance costs.

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Wainright, manager of apparatus product sales; J. A. Uttal, manager of component product sales; J. H. Purdy, manager of agency and distributor sales; E. G. Dudley, manager of sales, New York office; W. A. Raines, manager of industrial sales, New York office; G. E. Saunders, manager of transportation sales, New York office; H. M. Bardin, manager of government sales, New York office.

General Electric Co., Silicone Products Dept.: Burton B. White, supervisor of silicone rubber sales development, Waterford, N. Y.

SOUTH ATLANTIC

Feedrail Corp.: Elmer W. Rasmussen, Florida representative.

Graybar Electric Co., Inc.: Hamilton Corey, district sales manager, Atlanta; A. A. Wilson, manager at Charlotte, N. C.; H. S. Corey, Jr., manager at Asheville, N. C.

Thomas & Betts Co.: Billy R. Connor, sales staff, North Carolina area; Samuel S. Jett, Jr., sales staff, Virginia area.

Barber-Colman Co., Automatic Control and Uni-Flo Div.: D. W. Minick, manager, new branch office in Jacksonville, Fla.

General Electric Co., Tube Dept.: Donald G. Reik, district sales manager for replacement sales, Washington,

EAST CENTRAL

Graybar Electric Co., Inc.: Ralph Wethern, operating manager, new branch office at Green Bay, Wis.; Ralph H. Smith, manager of branch office at Flint, Mich.

Westinghouse Electric Corp.: A. M. Fisher, manager of new Chicago district office; V. S. Acton, industrial department manager, Mid-America Region; J. R. Walter, manager of Application Data and Training Dept., Mid-America Region.

Trade-Wind Motorfans, Inc.: Southern Agencies, Inc., representative in Tennessee, extending representation into Southern Ohio, Southern Indiana, and Kentucky.

The Okonite Co.: Thomas J. Manning, district manager, Cincinnati office.

Mitchell Mfg. Co.: Bruce E. Crockett, sales representative, Wisconsin district.

General Dynamics Corp., Electro Dynamic Div.: James J. Becher, sales engineer, Chicago district office.

General Electric Co.: Walter F. Brown, Chicago area sales representative, silicone products department; Richard A. Steenrod, silicone sales representative at Cincinnati; Arthur D. King, superintendent of Cleveland apparatus service shop; Harold Bongarten, superintendent of Detroit apparatus service shop.

General Electric Co., Apparatus

Sales Div., Central District: S. M. Vance, manager of sales; G. D. Downing, manager of apparatus product sales; J. M. McNulty, manager of component product sales; J. W. Blake, manager of agency and distributor sales; W. J. Curry, acting manager of advertising and sales promotion; L. Griswold, office manager and manager of electric utility sales, Chicago office; R. M. King, manager of user industries sales, Chicago office; F. I. Richards, manager of resale industries sales, Chicago office.

General Electric Co., Apparatus Sales Div., East Central District: E. H. Howell, manager of sales; R. C. Hardy, manager of industry sales; G. J. Clark, manager of apparatus product sales; C. J. Miller, manager of component product sales; R. E. Boyle, manager of Cleveland office; E. F. Taggert, manager of electric utility sales, Cleveland office; P. C. Shirkey, manager of heavy industry sales, Cleveland office; K. F. Culler, manager of medium industry sales, Cleveland office; P. S. Salstrom, manager of light industry sales, Cleveland office; R. A. Hammond, manager of engineering, Cleveland office.

W. H. Brady Co.: Fred C. Kluhsman, Chicago district representative.

Thomas & Betts Co.: Myron Bielat, sales staff, Chicago office.

Columbia Cable & Electric Corp.: Stout Electrical Sales Co., representative in New Orleans, La.

WEST CENTRAL

Graybar Electric Co., Inc.: E. A. Bartlett, manager, and F. N. Chance, operating manager, new branch office at Sioux City, Iowa.

Solar Light Mfg. Co.: Frank X. Chassaing, sales representative in state of Texas.

General Electric Co.: John C. McGranaghan, district sales manager for replacement tube sales, St. Louis, Mo.

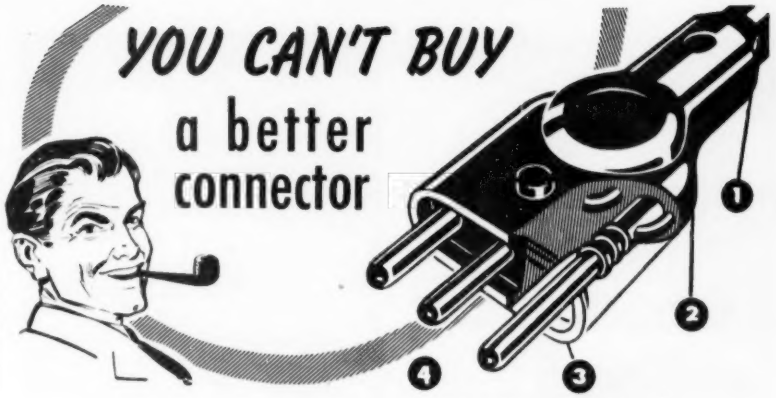
Trade-Wind Motorfans, Inc.: R. D. Little Co., representative in North Dakota, Minnesota and Western Wisconsin.

Columbia Cable & Electric Corp.: Chas. K. Ramond Co., representative in New Orleans, La.; Tom Hodges & Co., representative in Tulsa, Okla., and Kansas City, Mo.

WEST

Pittsburgh Standard Conduit Co.: Gordon W. Laursen, agent in New Mexico and West Texas territory.

General Electric Co., Apparatus Sales Div., Northwest District: J. S. Lester, manager of sales; H. R. Loew, manager of apparatus and component product sales; T. M. Purton, manager of marketing research.



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(1) Sturdy one-piece cable connector assemblies

(2) Safe, long-lasting resilient Neoprene jacket

(3) Water-seal prevents moisture infiltration

(4) Contacts firmly embedded in connector body

Falls, blows, oil, acids, sunlight and moisture little affect the life or performance of JOY electric plugs or receptacles. Molded as one-piece Neoprene units they can't crack or shatter and won't become "out-of-round" Before you buy, it will pay you to learn why these and other worthwhile features have made them an outstanding choice of American industry.

Write for your FREE copy of JOY connector bulletin MC-108, now!

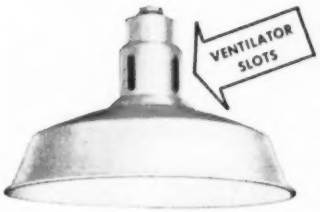
More than 100 Years of Engineering Leadership M. E. 1151.2

JOY MANUFACTURING COMPANY

HENRY W. OLIVER BUILDING, PITTSBURGH 22, PENNSYLVANIA

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LTD., GALT, ONTARIO

COOLER LIGHTING
CLEANER LIGHTING
LONGER LAMP LIFE



• This original ABOLITE idea starts automatic air circulation around the lamp and thru the ventilator slots of the ABOLITE reflector thus keeping lamp and reflector surfaces cleaner, longer. Lamp necks stay cooler to provide maximum lamp life.

ABOLITE is your *first choice* in lighting reflectors. First with new ideas — ventilator slots, all-white porcelain finish. First with practical features for easy installation — outlet box reflectors. First with the new designs for new type lamps—the Protecto-Shield for R-52 and R-57 lamps. There's an ABOLITE for every lighting requirement.

WHITER THAN WHITE **ABOLITE** *Lighting*

THE JONES METAL PRODUCTS CO. • West Lafayette, Ohio

***OTHER FIRSTS* FROM ABOLITE**

OUTLET BOX REFLECTOR
Available in both RLM and Shallow Dome designs.

JIFFY-LITE
No more unsafe "naked bulbs." Two piece socket and reflector form single lighting unit that screws into any socket. No tools needed. Low priced.

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A complete line for every application from parking lots, and railroad yards to sign lighting or sport fields.

PAY JOBS... JACKSON REFLECTORS
SOLD ONLY THRU DISTRIBUTORS
JACKSON PRODUCTS
1026
1614
1314
Every job is a profit job when you have the Jackson line of INDUSTRIAL REFLECTORS. Your customers get good service with a minimum of maintenance — at reasonable cost. You get quality and prompt service that pays off on every installation.
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Reflectors
Yardlights
Vaporproof Units
Weatherproof Sockets
• Available immediately at your wholesaler
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Richards-Wilcox Electric Door Operators
for Residential • Commercial Industrial Installations
• Convenient
• Practical
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For complete information, ask your jobber or write for R-W catalog A-87.
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Reg. U. S. Pat. Off.
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"A HANGER FOR ANY DOOR THAT SLIDES"
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We'll give you quick delivery and lowest prices
ELECTRIC MOTOR PARTS
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WHOLESALE ONLY
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WODACK "DO-ALL", a Better Electric Hammer
Costs No More. Try It. You'll Like It.
Are You Satisfied
with the electric hammer you are using? Is it slow, too heavy or needing too frequent repairs. Try the Wodack® "Do-All" Combination Hammer and Drill.
Strikes 2400 hard blows a minute, drilling concrete up to 3" a minute. Runs from lamp socket. Is changed to a ¾" electric drill by opening the chuck and loosening the clamping screw. Preferred by many thousands of contractors and maintenance men. Get the facts. Ask for Bulletin 510-EC.
Wodack® Electric Tool Corp.
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STOP that WATER
With FORMULA NO. 640, a clear liquid which penetrates 1" plus in concrete, brick, stucco, plaster, etc. Seals out water, dirt. Holds 20' head. Use outside and in. Preserves all absorbent materials. Sold 14 years. Quick, economical, sure. $3 in 55's. Free sample. See Sweet's.
HAYNES PRODUCTS CO. OMAHA 3, NEBR.

New Advertisements
received by August 26th will appear in September issue, subject to space limitations.
Address copy to the Classified Advertising Division
Electrical Construction & Maintenance
330 West 42nd St., New York 36, N. Y.

EFFECTIVE BUSINESS PROMOTION

[FROM PAGE 76]

record the nature of the work, the time of a workman's arrival and his departure. One copy is left with the customer for his records, giving him an accurate memo as to the extent of the labor and precluding any subsequent misunderstanding when the bill is rendered.

Calewo's policy of giving 24-hour service 365 days a year had its beginning back in 1920 when three young men noted that although the country around San Diego was liberally spotted with irrigated ranches requiring a good number of motors for pumping purposes, the few motor repair shops in the area were not equipped to give either fast or complete service. Damaged or burned-out motors frequently had to be shipped to Los Angeles for repair, resulting in days or even weeks of shutdown, often causing severe damage or loss of crops.

These young men had little capital—only about $500 each—but they had a big idea that appealed to motor users. At any hour day or night they were on call, ready, qualified and eager to rush a motor back into service as quickly as possible without charging overtime. This policy of going all-out to give prompt service was backed by consistent performance and customers soon got the idea that the operation of their motors was more important to "the Calewo boys" than vacations or sleep. In fact, a pun which came into being in those early days is still frequently heard, that "while others sleep, California Electric *Works*." This attitude bred confidence, satisfaction—and business. And, after three decades, the policy is still in effect although the number of partners has increased from three to ten, employees have jumped from zero to 150, customers have expanded from a handful to 2500, and net physical worth has climbed from a few thousand dollars to over a quarter-million.

As business grew, so did the company, branching out to handle V-belts and lubricants, then appliances, electrical supplies, all types of wiring, planned lighting, ventilation, marine and line work, plant maintenance and engineering.

Nine Businesses in One

In this across-the-board organization, nine of the ten present partners handle problems of separate departments, such as industrial, sales, purchasing, stock, engineering, motor re-

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT • BUSINESS EQUIPMENT — USED OR RESALE

OPPORTUNITIES

UNDISPLAYED RATE

(Not available for equipment advertising)

$1.20 a line, minimum 3 lines.
To figure advance payment count 5 average words as a line.

POSITIONS WANTED & Individual Selling Opportunity wanted undisplayed advertising rate is one-half of above rate, payable in advance.

Box Numbers—Count as one line. Replies mailed same day received.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

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The advertising rate is $11.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

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ELECTRICAL CABLE

- for every industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular suppliers.
- Cut to length. Reasonably priced.

UNIVERSAL Wire and Cable Co.
2664 N. Clybourn Ave. Chicago 14, Ill.

IN STOCK FOR IMMEDIATE DELIVERY

Every type & size of electric wire & cable. Underground cables for direct burial without pipes. Overhead wire, welding cable, asbestos cable, multiconductor cords, elevator cable, high voltage cable, bare, triple braid weatherproof.

Eastern Electric Sales Co.
5425 Pennsgrove St., Phila., Pa. GR 4-5900

WORLD'S LARGEST INVENTORY

FREE CATALOG

MOTORS–GENERATORS–TRANSFORMERS
New and Guaranteed Rebuilt
1 H.P. to 2500 H.P.

ELECTRIC EQUIPMENT CO.
P. O. BOX 51, ROCHESTER 1, N.Y.

BOOKS

ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK
"A Unique Tool of the Trade"
WRITE FOR DESCRIPTIVE FOLDER TO
THE ESTIMATOR PUBLISHING CO.
4102 Wilson Road Kenosha, Wis.

"SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

pair, production and the like. Each division is handled as a separate business, yet there is a cooperative interchange of ideas at all times. The tenth partner, V. R. Knight, is general manager, coordinating all activities in the company.

In an age when many electrical contractors believe that it is necessary to minimize jobs in order to attract business and customer good will, it is encouraging to see that the public is receptive to such arguments as, "Electric wiring is the doorway through which power enters your plant. If this doorway is not sufficiently large it becomes a bottleneck. Plant maintenance begins with efficient planning before installation. Right equipment rightly placed saves repair bills. No sale is a service unless it includes reliable equipment, used for its intended purpose, and sold at a fair price." These declarations are backed by consistent practice, every job being engineered not only for safety but for efficiency as well, and only national brands of tested quality being carried in stock.

As General Manager Knight summarizes, "Our growth is something of which we are proud, but we are prouder of the fact that many of our first-year customers are still with us. This is due, we believe, to the 'customer relations' policy which we have always followed. We have the idea that salesmanship starts with the sale of good will, building and maintaining harmonious relations with customers by trying our utmost to make every transaction a pleasant one, whether the job is large or small. Regardless of how we rate ourselves, it is how we rate with our customers that counts."

And therein lies the formula for a successful business.

THE OPPORTUNITY to discuss mutual problems with a fellow contractor is a convention feature appreciated by Harold Foley (left), Zentz Electric Co., Elmore, Minn., and R. C. Willette, Blue Earth Electric, Blue Earth, Minnesota.

How to handle all types of *wiring and installation jobs*

in strict accordance with the 1951 National Electrical Code

HERE is the electrical contractor's job book completely revised to conform with the 1951 Code requirements and planned to enable electricians to understand and do work in accordance with the National Electrical Code.

In Abbott's Handbook, you will find explanations of the rules and measurements for the various types of jobs—what they mean—how to apply them. Wherever a ruling in the Code lacks clarity, it is carefully reviewed and its application explained. More involved paragraphs have been divided into short and simple rules, and many rules have been restated in simple language. Diagrams, sketches, and illustrations are used freely to help you understand the rules quickly and easily.

Revised 7th Edition

National Electrical Code Handbook

By Arthur L. Abbott

652 pages, 5 x 7¼, semi-flexible binding, 441 illustrations, $7.00

Partial list of Contents—

- approved types of wiring
- cable assemblies
- requirements applying to all raceways
- outlet, switch, and junction boxes
- electrical appliances
- grounding
- outside wiring
- overcurrent protection
- communication systems
- elevators

This is an unusually practical book, especially planned for quick reference use by practical men. It gives rules and requirements for all jobs in accordance with the latest National Electrical Code. *All the rules for a job are in one place.* With this Handbook to help you, you cannot miss a single rule and you cannot fail to understand all the rules. Includes everything from special requirements pertaining to hazardous locations to complete tables giving the full-load current, wire size, conduit size, and branch fuse rating of various types of motors. Contains a Key to the Code on the covers and fly leaf.

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McGRAW-HILL BOOK CO.,
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Send me Abbott's NATIONAL ELECTRICAL CODE HANDBOOK for 10 days' examination on approval. In 10 days I will remit $7.00, plus few cents for delivery, or return book postpaid. (We pay for delivery if you remit with coupon; same return privilege.)

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City ..... Zone.... State .....
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Position EC-8

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SEARCHLIGHT SECTION

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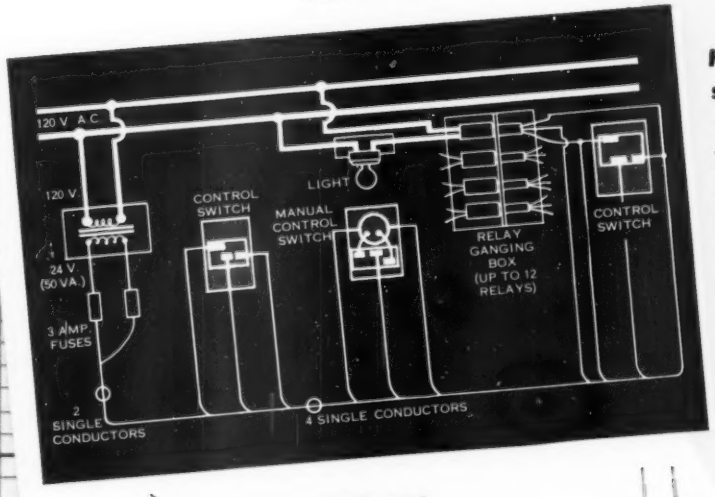
The Swing is to LOW VOLTAGE CONTROL

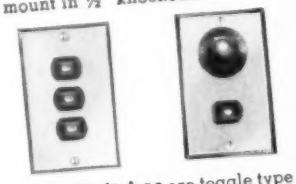
. . . and you'll prefer SQUARE D for a lot of reasons



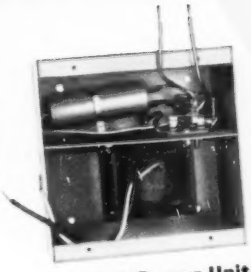
Here is a low voltage remote control system with all the features you've wanted . . .

Because it saves so much installation time, the cost of this very flexible system compares favorably with conventional systems. Actually less, in many cases. It offers a super-convenient means of switching lighting and appliance circuits. It has scores of applications—in homes, office buildings, schools, churches, warehouses, factories.

Relays are extremely rugged. 20 amperes, 120 volts A.C. Also 20 amperes, 277 volts A.C. for low voltage control of high voltage fluorescent lighting. All relays mount in ½" knockouts.

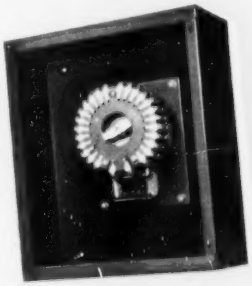


Control Switches are toggle type and fit Despard plates and straps. One, two, or three control switches (*left, above*) or one **Manual Selector Switch** and one control switch (*right, above*) can be mounted on a single strap. Manual selector switch controls from 1 to 9 circuits. Key-operated switch also available.

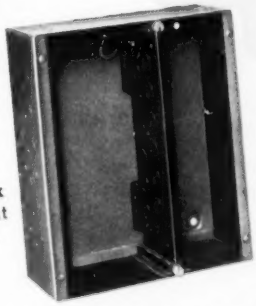


D.C. Power Unit, designed for consistent and trouble-free service. Eliminates A.C. hum.

Relay Ganging Box for speedy, convenient and quiet installations.



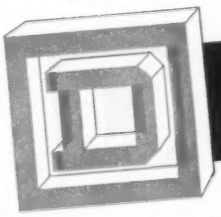
Master Controller automatically controls up to 23 individual circuits from any location.



Write for Low Voltage Control Bulletin.

Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS



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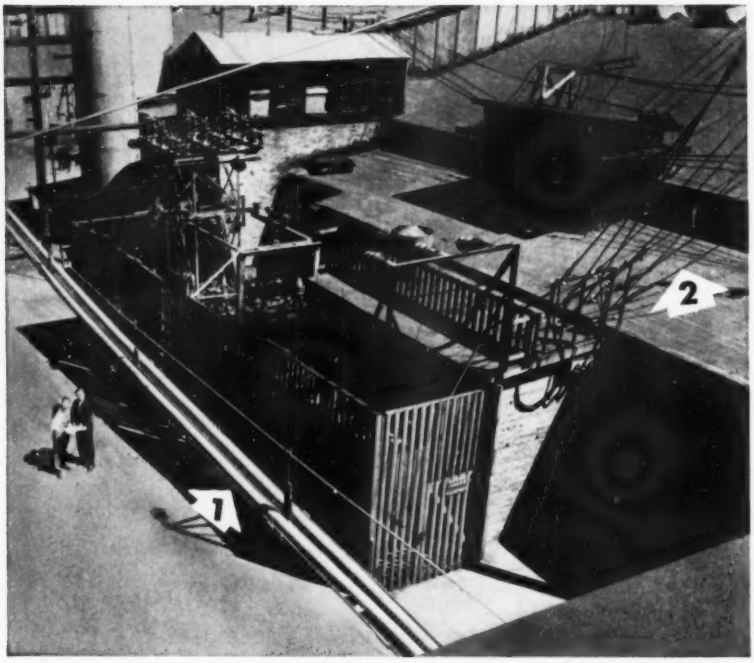


Two G-E armor cables (1) will replace the maze of open wiring (2).

Contractors Cut Costs With General Electric's V-c Interlocked Armor Cable System

You can reduce installation time and cut installation cost when you use the G-E V-c interlocked armor cable system.

The illustration above shows how two armored cables (1) can replace two dozen low-voltage cables (2). This improvement is part of the complete electrical modernization of Kaiser-Frazer's newly-acquired parts plant in Dowagiac, Michigan—recently completed by the Koontz-Wagner Electric Company of South Bend. Installation costs were minimized by using G-E armor cable to feed 4.16-kv into five load centers for a radial distribution system.

G-E No. 1799 varnished-cambric-insulated interlocked armor cable is light and flexible—long lengths can easily be pulled into position and bent around corners and projections. It can be spliced quickly with simple mechanical joints. Your customers will like the space savings and easy accessibility of an armor cable installation, too. For more information, write Section **W86A-818**, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Registered Trade-mark General Electric Company

1878 75 1953 YEARS OF ELECTRICAL PROGRESS

You can put your confidence in—

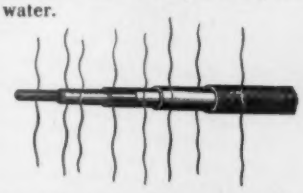
GENERAL ELECTRIC

WIRE AND CABLE IDEAS for Electrical Contractors

Cable application booklet: Tells how to select, splice, and terminate G-E Versatol* Geoprene cable—the all-purpose, rubber-type cable for dependable wiring. Write for your free copy.

New BX* armored cable is lighter and stronger: By utilizing glass braid, imprevious to rot and flame, G-E has developed a new, smaller-diameter BX cable that carries U. L. listing. It is lighter, stronger, and easier to pull through drill holes than ever before.

Heavy-duty portable cords: Designed for heavy-duty portable electric equipment, in garages, factories, and wherever severe service conditions are encountered. G-E Type S rubber-jacketed cords are tough, flexible, durable, and resistant to most acids, alkalies, and water.



For high-temperature wiring—G-E Deltabeston*: Let your G-E Construction Materials distributor help you select the right Deltabeston wire or cable for protection against average or extreme heat conditions, as well as moisture, oil, corrosive vapors, or abrasion.